THIRD SERIES VOL 65 NUMBER 1 NOVEMBER 1957

66 PORTLAND PLACE LONDON W1 · THREE SHILLINGS AND SIXPENCE

Joachim Diederichs

Interbau, Berlin. L.-R.: Blocks designed by Professor Walter Gropius, Pierre Vago and Professor Alvar Aalto

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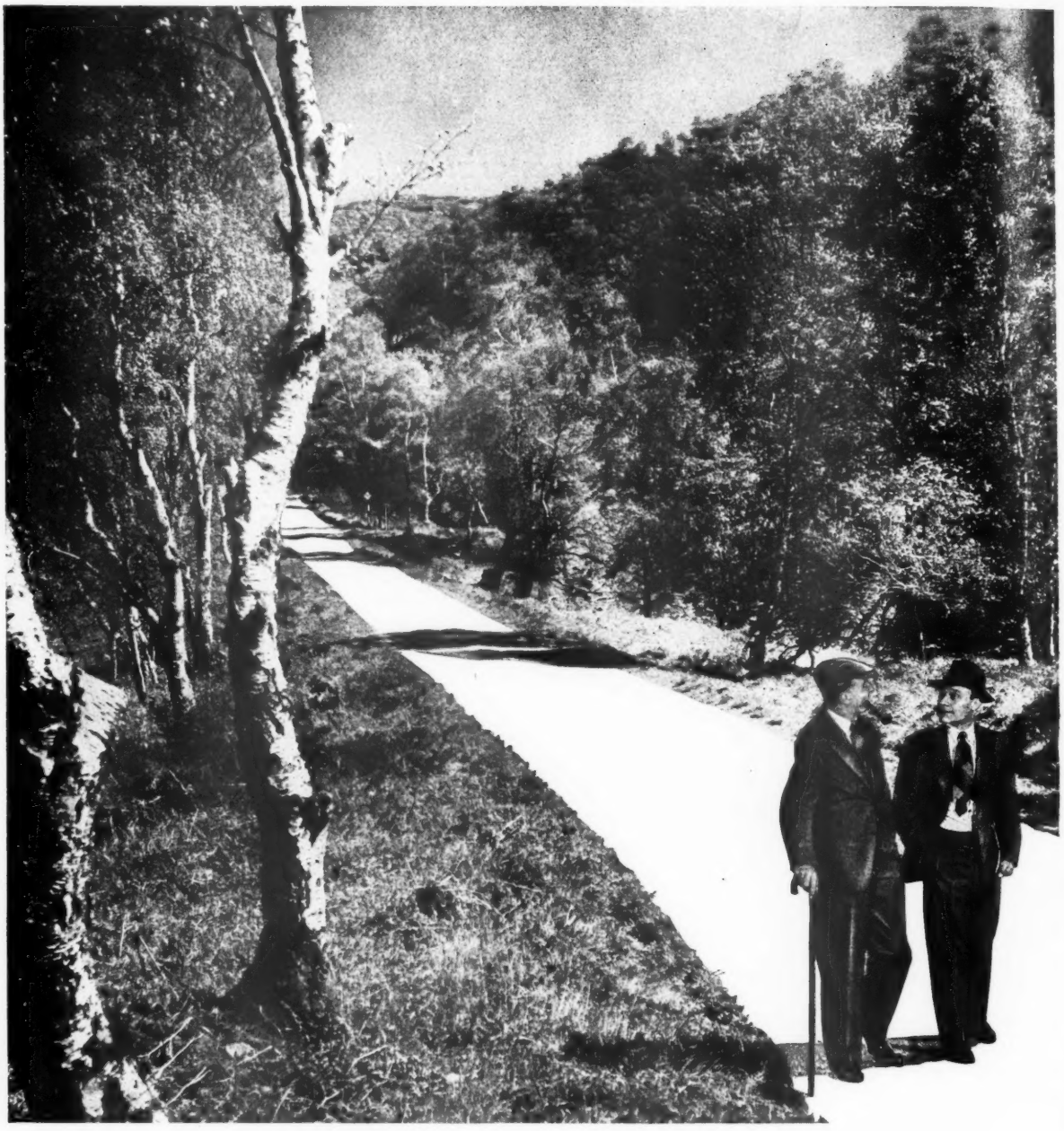

"Beautiful trees—silver birches! Which reminds me—British Plaster Board are having a real live silver birch tree on their stand at Olympia."

"Rather a novelty. What's the idea?"

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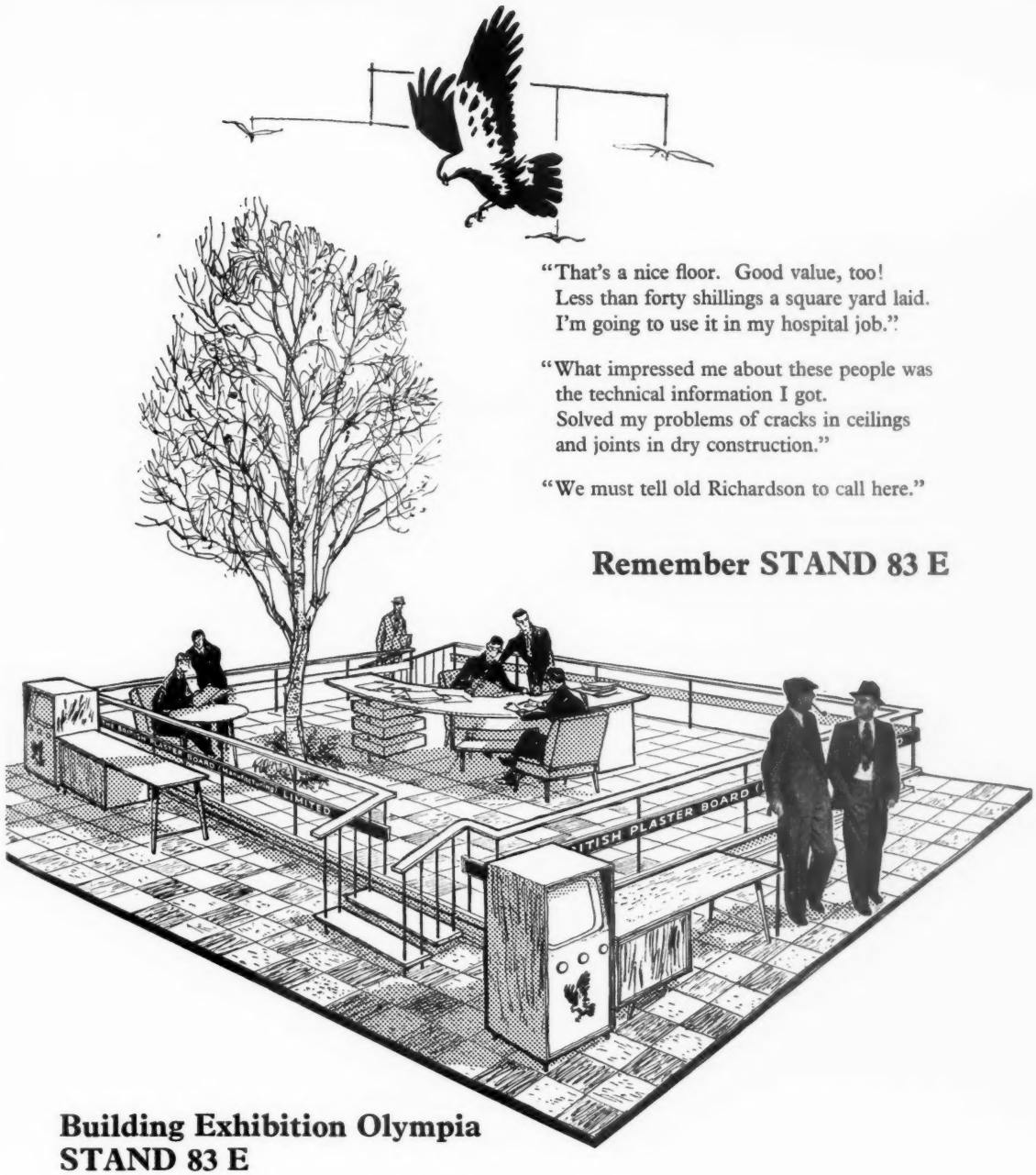

"That's a nice floor. Good value, too!
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Solved my problems of cracks in ceilings
and joints in dry construction."

"We must tell old Richardson to call here."

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Building Exhibition Olympia
STAND 83 E

OUR stand this year is rather unusual. You can identify it by the Blue Hawk hovering over the silver birch tree. We are using it as a Technical Service Bureau, where you can discuss your problems with us in pleasant surroundings.

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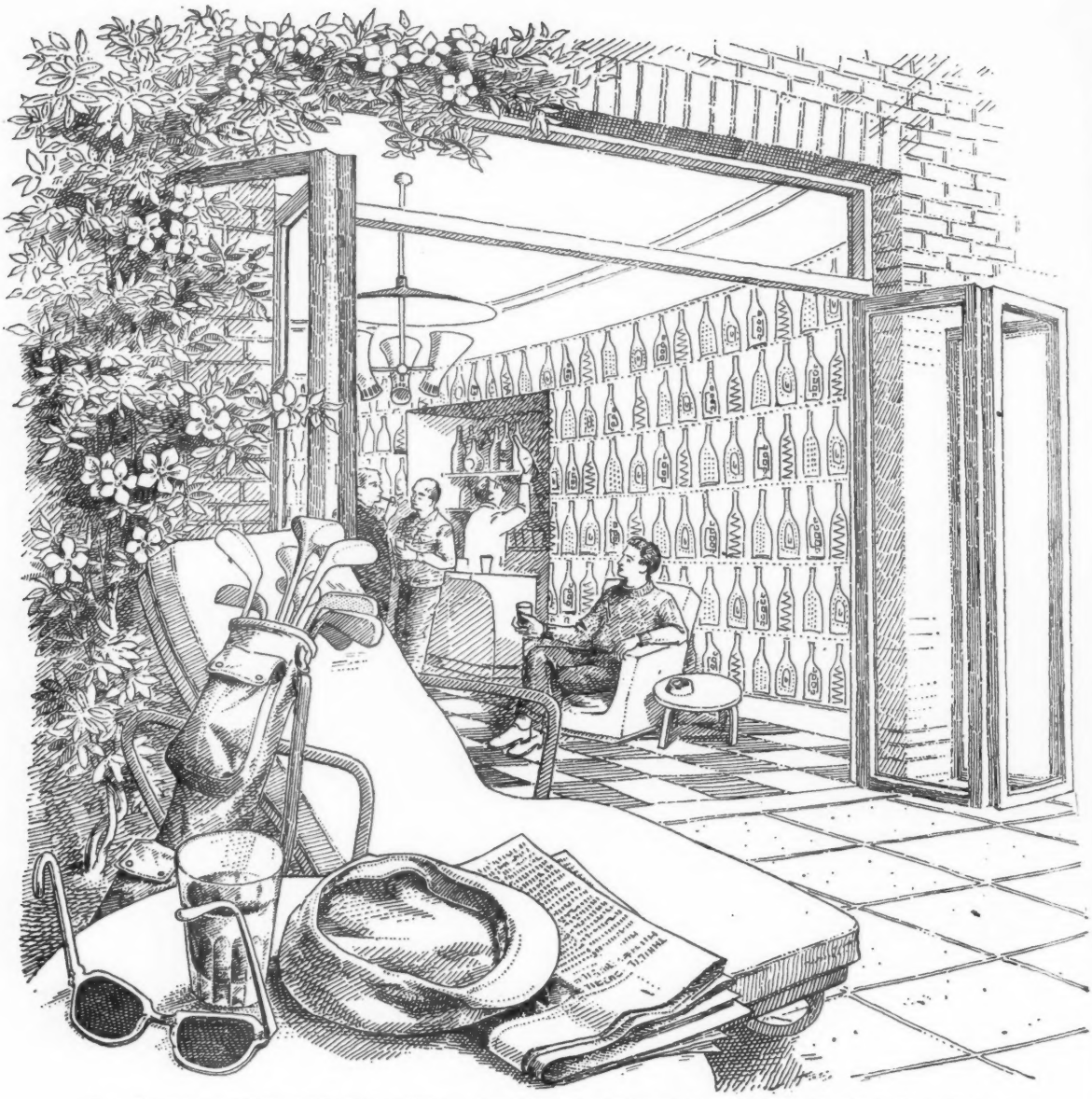
AP 41



The wallpaper shown, ' Malaga ' Palladio No. 44023, is a colourful hand printed design suitable for club houses. Drawing by Gordon Davies.

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The primary purpose of our ARCHITECTS' DEPARTMENT is to give advice on the use of wallpaper, but we welcome enquiries relating to the interior scheme of decoration as a whole. Our products may be seen at the Showrooms in London and Manchester, and if required we can provide a complete specification incorporating wallpaper, paints, furnishing fabrics and floor coverings. The Architects' Showroom in London is reserved exclusively for the use of Architects, Interior Designers and their clients.

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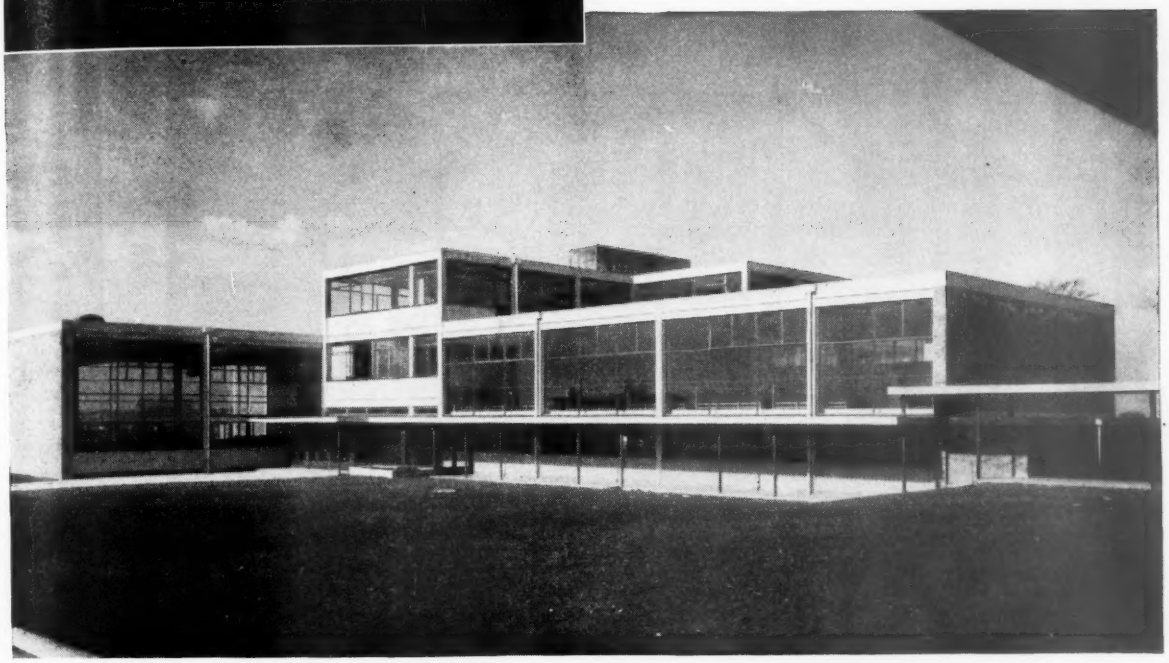

Lockleaze School, Bristol. Photograph reproduced by courtesy of Holland & Hannen and Cubitts Limited.

Construction carried out under the supervision of the City Architect of Bristol, J. Nelson Meredith, F.R.I.B.A.

This modern school in Bristol was built with hard limestone as the concrete aggregate. Such concrete has a low shrinkage factor and possesses high compressive and flexural strengths. It has, moreover, excellent fire resisting properties.

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The building was erected under the direction of the Chief Engineer of The Imperial Tobacco Co. Ltd.
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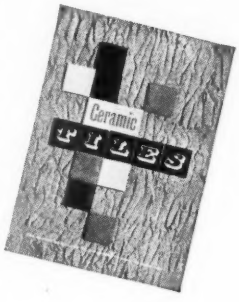

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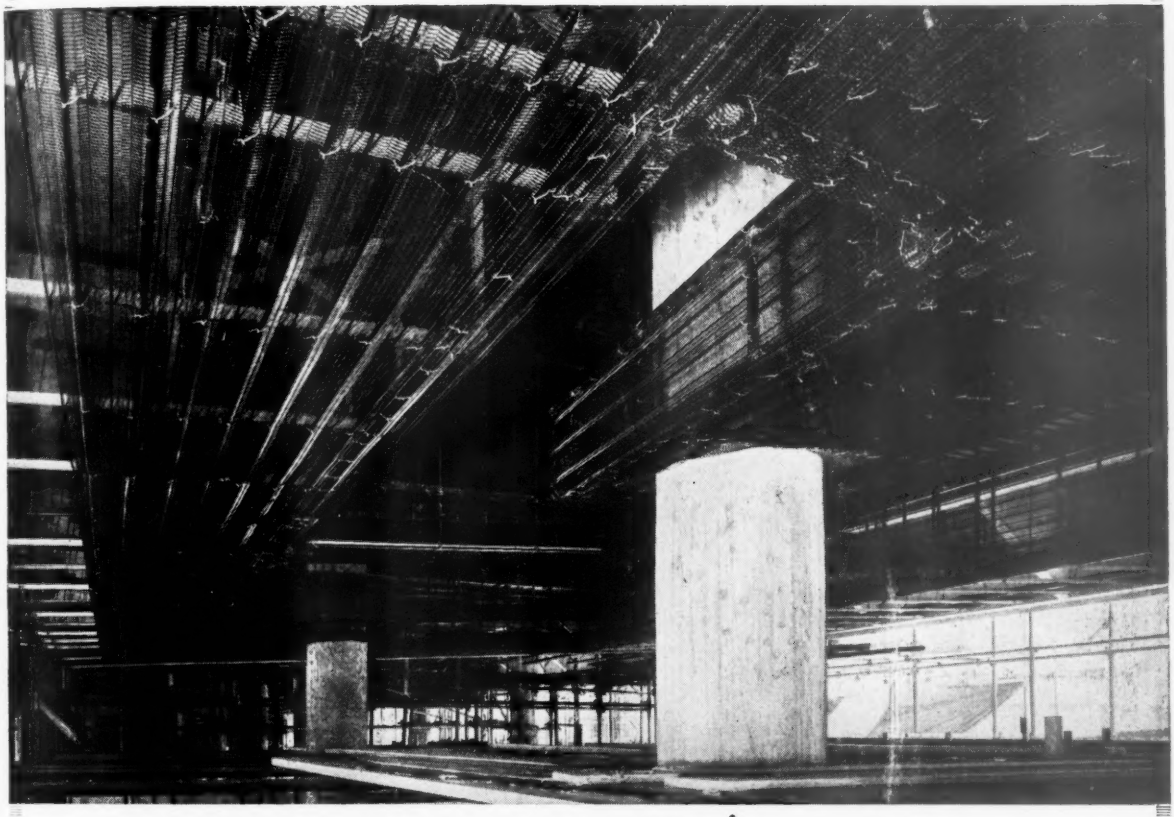
Suspended Ceilings



"Riblath" Suspended Ceilings supplied and fixed at the County Hall extension, London. Architects: L.C.C. Architects' Department. Contractors: GEE WALKER & SLATER LTD.

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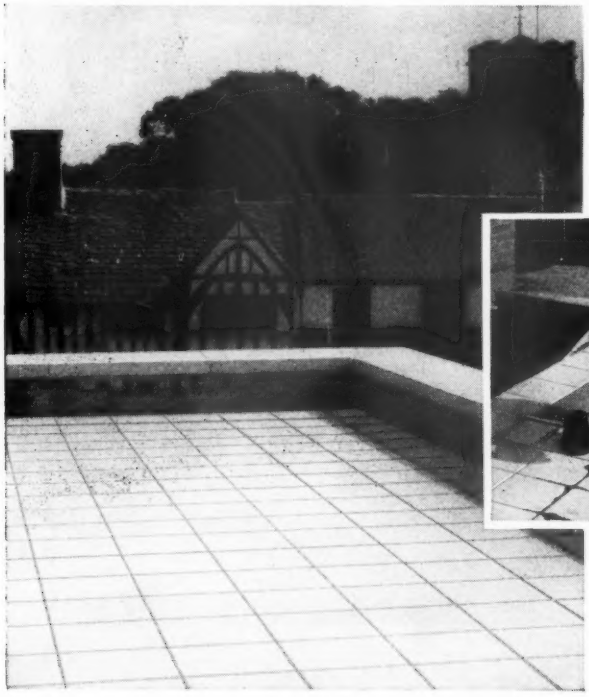

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Architect: Rainger, Rogers & Smithson, FF/AA/R.I.B.A.

Below: THE GEORGE HOTEL, CRAWLEY, SUSSEX.
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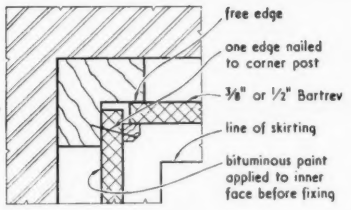
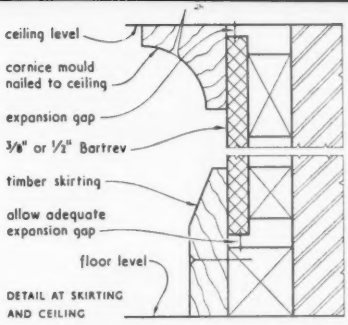
PARTITIONING



note: one vertical edge of board should be nailed at 16" centres leaving opposite edge to move freely behind a cover mould

PLAN SHOWING TYPICAL FIXING AT CORNER



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The standard width of Bartrev is 4 feet, and the following thicknesses are recommended: $\frac{3}{8}$" and $\frac{1}{2}$" for double-skin construction and wall lining, and $\frac{5}{8}$" and $\frac{3}{4}$" for single-skin partitions.

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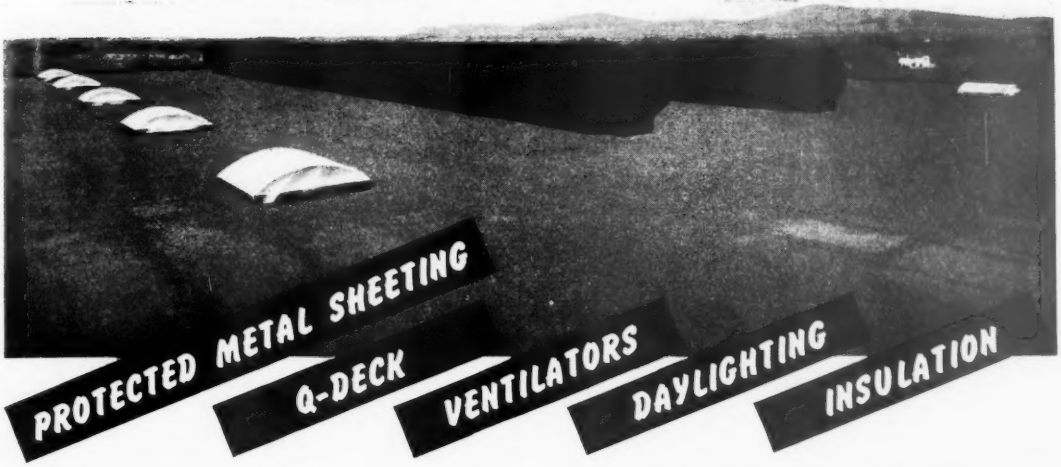
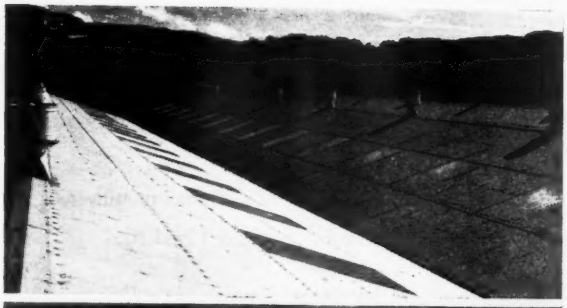
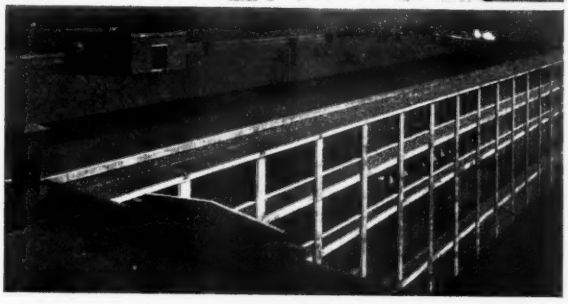
BARTREV

THE ROBERTSON THAIN

COMPREHENSIVE ROOFING SERVICE







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This service reduces the problem of co-ordinating site activities during erection and by accepting UNDIVIDED RESPONSIBILITY for the finished roof, safeguards the clients interests.

Illustrations show:

Top: *Robertson Q-DECK with Robertson DECKLIGHTS and ROBERTSONRIDGE VENTILATORS at the Chance-Pilkington Works.*
Consultant Architects: Ormrod & Partners, Liverpool.
Main Contractors: Holland & Hannen and Cubitts, Ltd.

Centre: *ROBERTSON PROTECTED METAL Sheeting with ROBERTSON ROUND VENTILATORS on the roof of the new factory erected for Messrs. Electrolux Ltd., Wellington, New Zealand.*

Bottom: *Robertson Q-DECK roofing the extension at Messrs. Kellogg Company of Gt. Britain.*
Robertson Round Ventilators were also supplied.
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LBC
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Assistant-in-Charge: B. H. Frankcombe
Contractors: Holland & Hannen and Cubitts Ltd.
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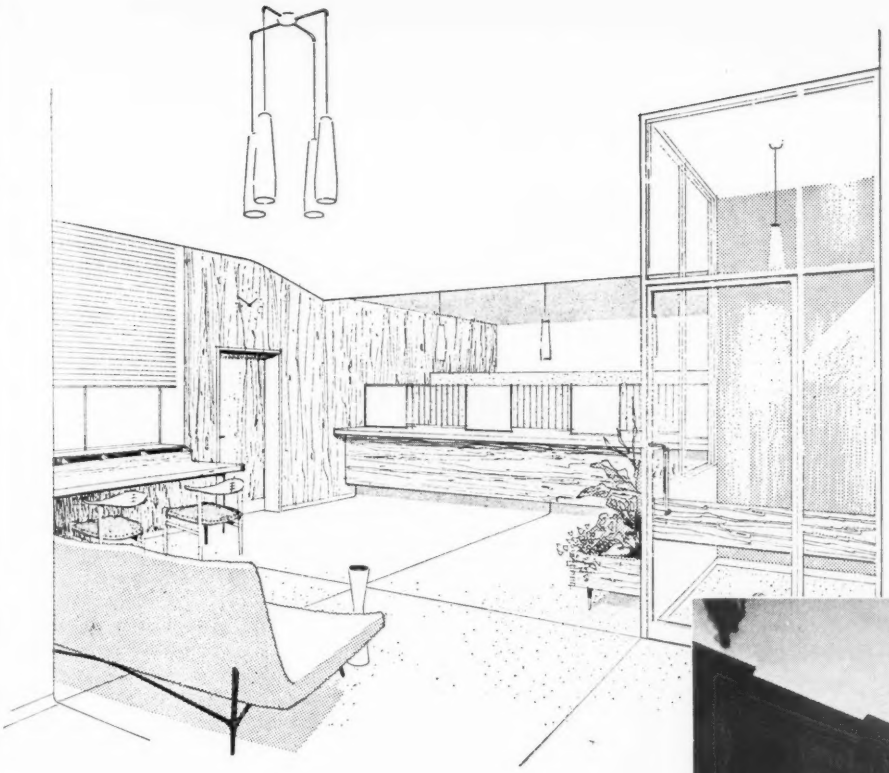

A Masterpiece in Wood is the screen in the Great Hall, Charterhouse, which was recently restored by Green & Vardy. Another example of the artistry and skill possessed by Green & Vardy's craftsmen is the intricate and beautiful woodwork which decorates the House of Commons.

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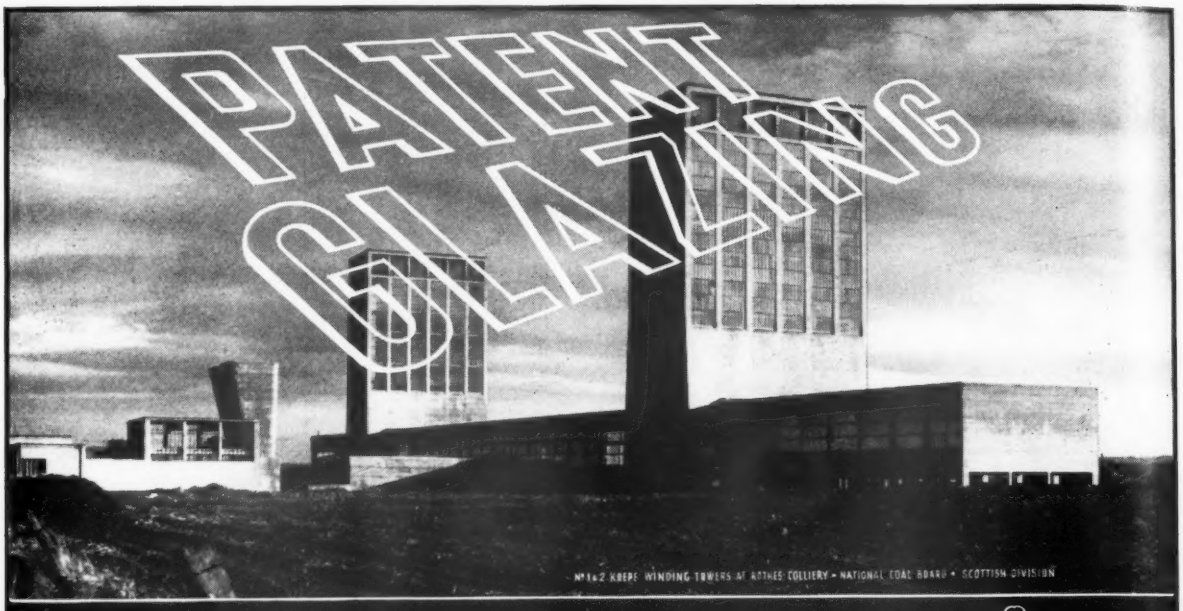

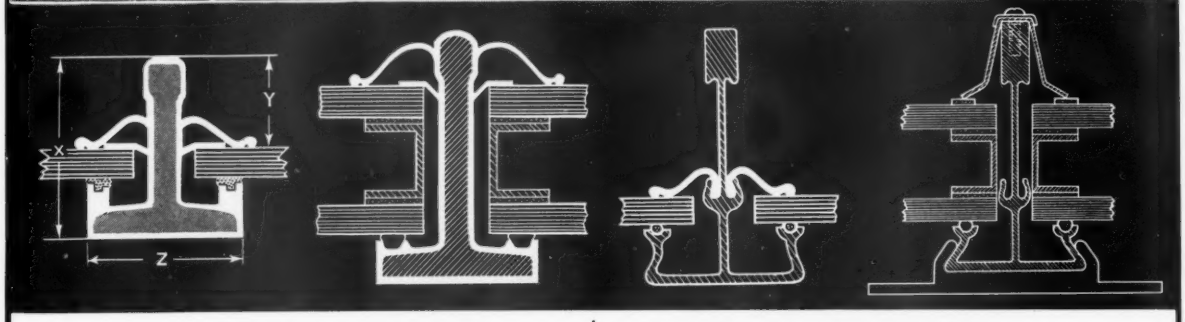

GLAZING WITH LEAD CLOTHED BARS

Section	Dimensions X	Y	Z	Maximum Length supplied	Weight per linear foot
No. 0	1¼"	7/8"	1¼"	5'6"	3.0 lbs.
No. 1	1¼"	1⅛"	1¼"	7'6"	3.5 lbs.
No. 2	2¼"	1⅛"	1¼"	10'6"	4.0 lbs.
Double Glazing	2⅛"	–	1⅛"	10'0"	–

For panes 24" wide. Bars should be spaced at 24⅛" centres. Steel purlins should be drilled at standard backmarks — one ⅝" diameter hole for top and bottom fixing at bar centres.

Weight per square foot of glazing including ¼" thick rough cast double rolled glass or ¼" wired cast glass, and lead clothed bars.

Bar No. 0
4.82 lbs. per sq. ft.
Bar No. 1
5.25 lbs. per sq. ft.
Bar No. 2
5.50 lbs. per sq. ft.

THE HEYWOOD FEATURES

Continuous lead sheath, hermetically sealed galvanised steel core of robust section. Asbestos cord cushions held in grooves. Copper glass stop set-screwed to bar.

DOUBLE GLAZING

Fully lead clothed galvanised steel core. Double lead wings. Aluminium-alloy separator to give an air space of approx. ¾", bedded on to efficient sealing strip. Asbestos cord seating for inner layer of glass. Phosphor bronze glass stop. Weight per square foot of glazing 9lbs.

GLAZING WITH ALUMINIUM ALLOY BARS

Section	Dimensions X	Y	Z	Maximum Length supplied	Weight per linear foot
No. 0	1⅛"	1⅛"	1¼"	6'0"	.953 lbs.
No. 1	2⅛"	1⅛"	1¼"	8'0"	1.08 lbs.
No. 2	2⅛"	1⅛"	1¼"	11'0"	1.18 lbs.
Double Glazing	2⅛"	–	1¼"	10'0"	–

For panes 24" wide, bars should be spaced at 24⅛" centres. Steel purlins should be drilled at standard backmark — one ⅝" diameter hole for top and bottom fixing at bar centres.

Weight per square foot of glazing including ¼" thick rough cast double rolled glass, or ¼" thick wired cast glass and aluminium bars.

Bar No. 0
3.72 lbs. per sq. ft.
Bar No. 1
3.79 lbs. per sq. ft.
Bar No. 2
3.84 lbs. per sq. ft.

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Extruded aluminium alloy glazing bars. Continuous lead or aluminium glazing wings. Asbestos cord cushions held in grooves. Aluminium glass stop bolted through web of bar.

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Extruded Aluminium-alloy section completely covered above the outer glass line by an aluminium capping. Aluminium-alloy separator to give an air space of approx. ¾" bedded on to efficient sealing strip. Asbestos cord seating for inner layer of glass. Aluminium-alloy glass stop. Weight per square foot of glazing 7¼ lbs.

Information Sheets from Dept. 15/H

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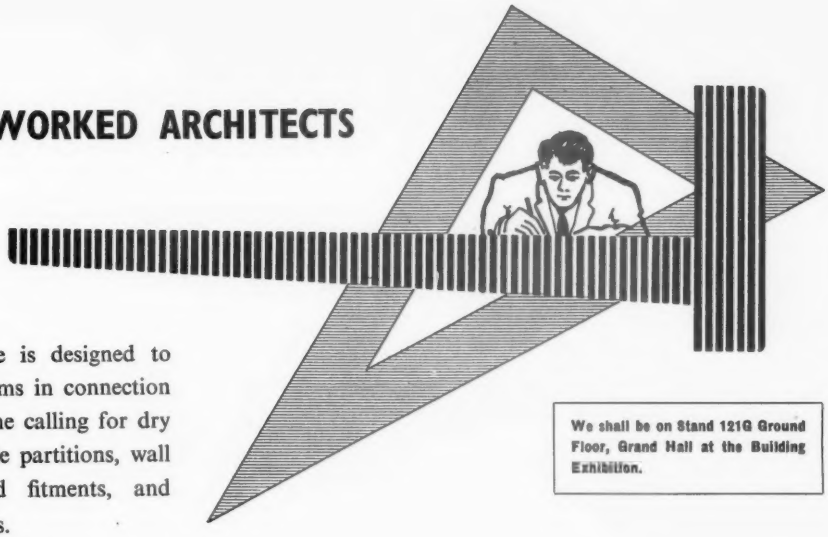

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for cooking

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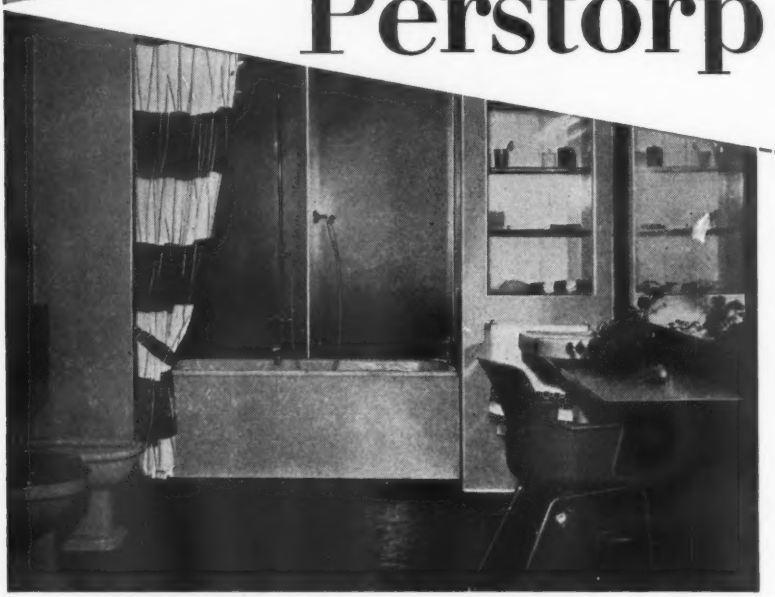

ideal
for bathing

The big canteen you see here has its walls and its tables surfaced with permanent, fadeproof, colourful Perstorp, the original plastic laminate. And the same with the bathroom.

Perstorp is the ideal greaseproof, dirtproof, steamproof surface for all manner of industrial uses. It can be cut to any shape, harmonise with any design or colour scheme, and it cleans with a wipe.

Boiling water won't affect Perstorp, neither will hot utensils, and its finish is a carefully thought-out balance between gloss and matt. On top of all this it's not expensive.

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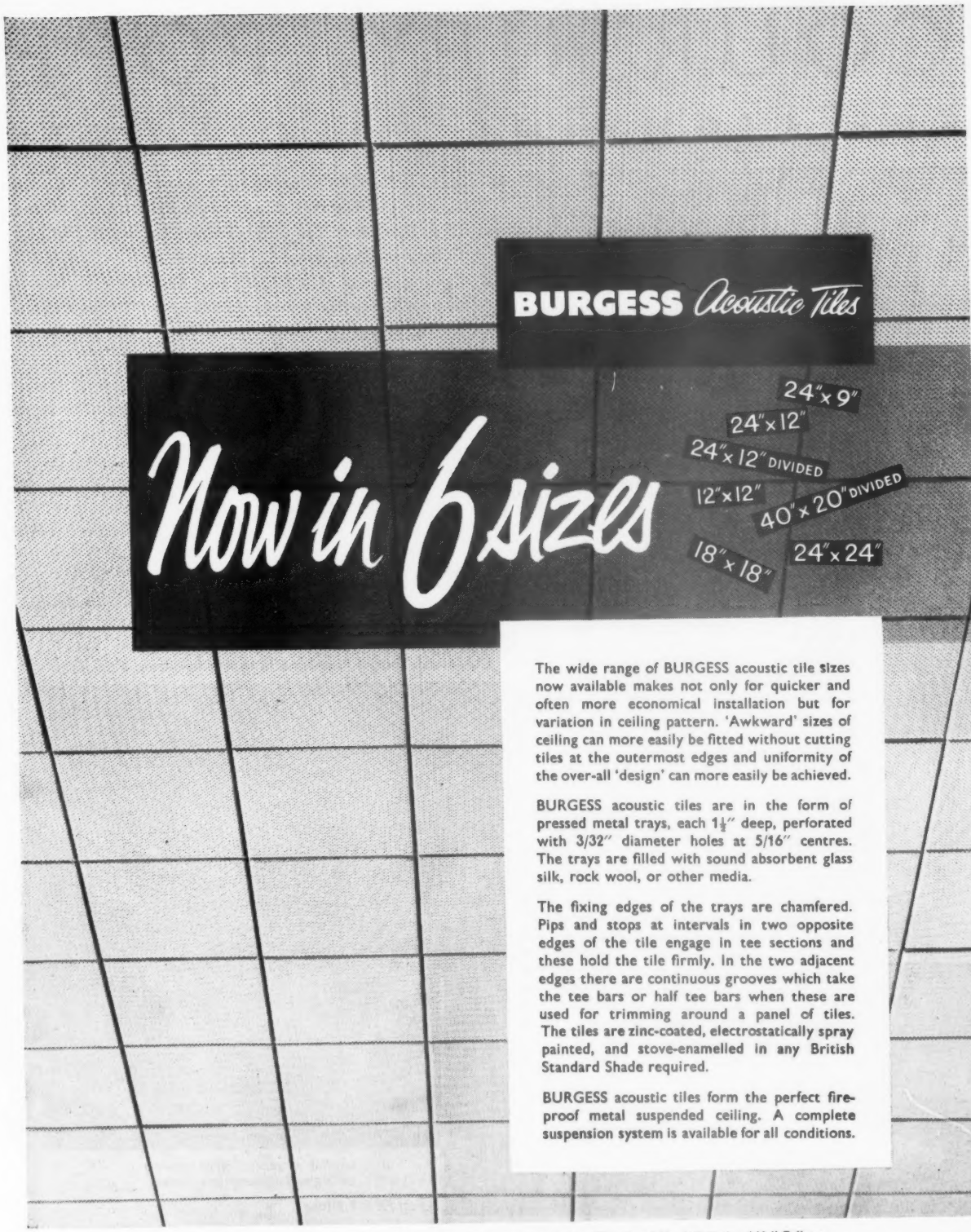

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The fixing edges of the trays are chamfered. Pips and stops at intervals in two opposite edges of the tile engage in tee sections and these hold the tile firmly. In the two adjacent edges there are continuous grooves which take the tee bars or half tee bars when these are used for trimming around a panel of tiles. The tiles are zinc-coated, electrostatically spray painted, and stove-enamelled in any British Standard Shade required.

BURGESS acoustic tiles form the perfect fire-proof metal suspended ceiling. A complete suspension system is available for all conditions.

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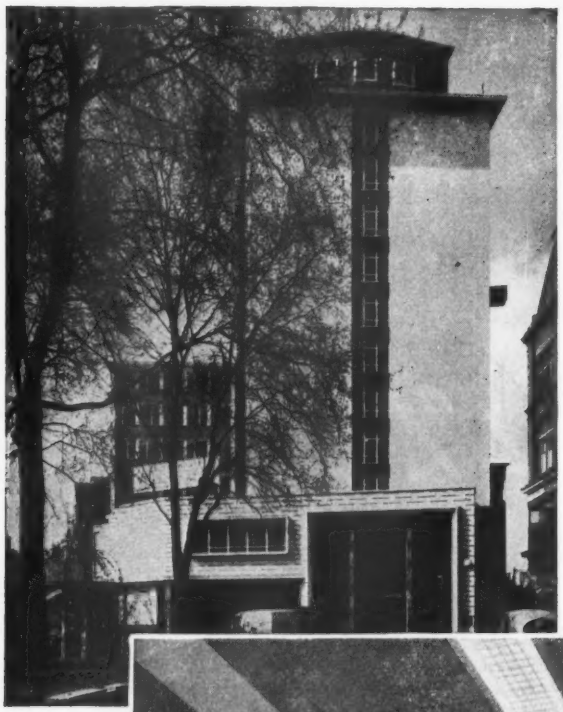

CALTEX HOUSE, occupied jointly by Messrs. Caltex Services Ltd. and Messrs. Albright & Wilson Ltd., is fitted throughout with the Burgess Metal Suspended Modular Ceiling utilizing some 2500 specially designed FX 277 lighting fittings. The FX 277 clips on to the "T" framework of the special ceiling, unaided by further suspension, and provides complete flexibility of design should subsequent alterations be made.

The Caltex House scheme is typical of many similar large office installations designed by the Courtney Pope Lighting Service, involving complete co-operation in the solution of lighting problems and the installation of special lighting fittings.

CALTEX HOUSE

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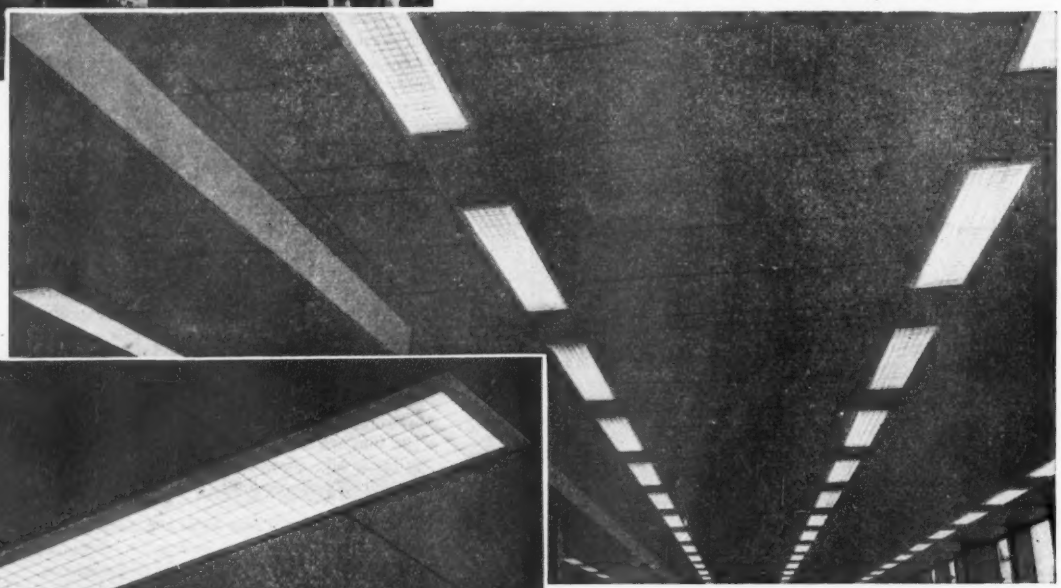
Architects:
E. A. Stone, Toms & Partners & R. H. Andrews-Jones & Son



Interior of general office showing ceiling and lighting installations.

(Inset) FX 277 Fitting.

COURTNEY, POPE (ELECTRICAL) LTD., AMHURST PARK WORKS, TOTTENHAM, LONDON N.15. (STAMFORD HILL 1270)

Architects: Messrs. Farmer and Dark, F/F.R.I.B.A.

New Central Research Laboratories and Engineering Division for The Bowater Paper Corporation Limited

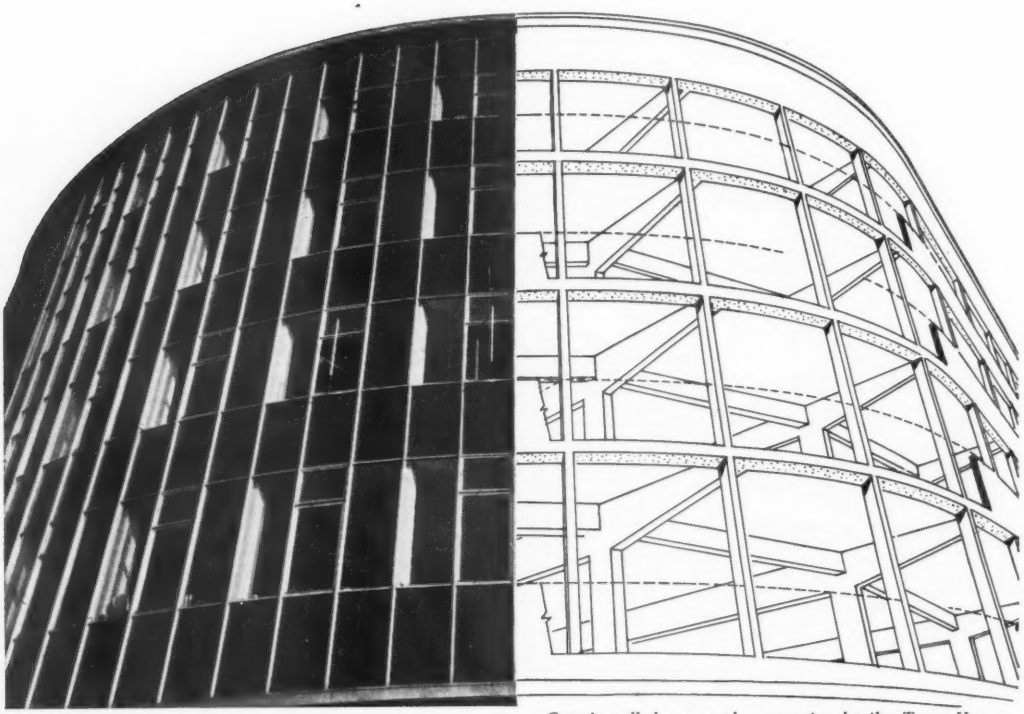
Part of the extensive developments on the Thames Mill Site at Northfleet, Kent, of The Bowater Paper Corporation Limited, are the Central Research Laboratories and Engineering Division blocks. These have a combined floor space of 55,000 sq. ft. served by a common entrance hall (illustrated). The structures are based on a module of 3 ft. 4 in. in all planes, with a framework of light welded steel and lightweight metal decking roof. Walls are almost entirely of glass with stainless steel trimming, and colour variation is obtained by asbestos panels set behind. Floors are in 2-in. precast concrete and acoustic ceilings accommodate recessed lighting, heating and ventilation grills. The colourful interior decoration combines individuality with breadth of design, while the exterior preserves the unity of the neighbouring production buildings.

ENGLAND · SCOTLAND · OVERSEAS

WILLIAMS & WILLIAMS NEWS SHEET

The story behind a 'Wallspan' Wall

Tower House, Hopton Street, S.E.1, was designed specifically to house a printing works. High floor loading had to be provided for but at the same time it was desirable to minimise the total load on the foundations —even so the foundations would carry a 35-story block of flats. This problem has



Curtain wall close up and construction detail at Tower House.

been ingeniously overcome. The structure is supported on reinforced concrete columns which are set back some 15 feet from the face of the building, the floor slabs being cantilevered out. An aluminium and glass curtain wall—Williams & Williams 'Wallspan'—is anchored to the edges of the floor slabs and backed up to sill height by a reinforced concrete stub wall.

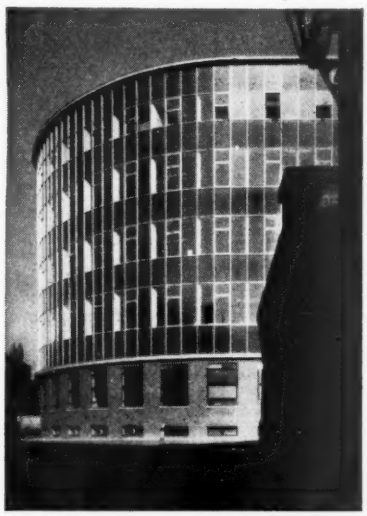
A secondary range of columns is placed immediately behind the curtain wall. These

are not structural but are designed specifically to support the floor loading—in this case printing machinery. Their very slim section was made possible by casing them in a thin layer of special fire-resistant vermiculite plaster.

The sweeping curved facade is the most striking feature of the contract. It is, as far as we can trace, the first time that a curtain wall of this description has been constructed to a curved building line—at least in Great Britain. It is in fact—as close examination of the photograph will show—faceted, each face spanning between a pair of the secondary stanchions referred to above. This arrangement involved a great deal of meticulously accurate draughting and cutting, especially as the curve is 3-centred and not part of a circle. The final result can be judged from its appearance.

Purpose-made aluminium windows by Williams & Williams have been used throughout and the infilling is reeded 'Plyglass'—in dark red on the front of the building and white at the back. The reeded texture allied to the vertical emphasis afforded by the 'Wallspan' mullions gives height and dignity to the facade which otherwise would be dominated by the horizontal pattern of windows and spandrels.

All in all Tower House is a notable contribution to London's architecture south of the river.



Tower House, Hopton Street, S.E.1,
for Messrs. Whitehead Morris Ltd.
Architect: Justin H. Alleyn, F.R.I.B.A.
Consulting Engineers: C. J. Pell & Partner.
Contractors: G. E. Wallis & Son Ltd.

THE JOURNAL OF THE ROYAL INSTITUTE OF BRITISH ARCHITECTS

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NOVEMBER 1957 THIRD SERIES VOL. 65 NUMBER 1 THREE SHILLINGS AND SIXPENCE

EDITORIAL

Royal Fine Art Commission

The Queen has been pleased to approve that Mr. Frederick Gibberd, C.B.E. [*F*], and the Hon. Lionel Brett [*F*] be reappointed members of the Royal Fine Art Commission on the expiry of their terms of office.

Honour

At the autumn convocation of McGill University, the honorary degree of D.Litt. was conferred on Professor Percy E. Nobbs, F.R.A.I.C. [*F*].

Report of the Committee on Building Legislation in Scotland

The Committee appointed by the Secretary of State for Scotland in January 1954 has now issued its report on Building Legislation in Scotland. It is an exhaustive document running to 388 paragraphs and 7 appendices. Professor R. H. Matthew, C.B.E. [*F*], was a member of the Committee. The Science Committee of the R.I.B.A. gave answers to a questionnaire and also gave oral evidence.

The Committee's recommendations provide for a new Building Act to replace various existing statutes and bye-laws, and laying down general machinery of building control. Structural requirements, however, says the report, should be in Regulations. Building control should be exercised in the interest of the public health and safety. Regulations would form a building code giving uniformity of building requirements throughout Scotland, and thus exclude detailed requirements from statutes. Modifying control over buildings designed by persons with professional qualifications was not considered to be justifiable. (This presumably refers to structural design.) On the other hand the Committee recommend that qualifications of officials dealing with building codes should be prescribed by law. The report is obtainable from H.M.S.O., price 5*s.* 6*d.* or 6*s.* 3*d.* including postage.

The Council of the R.I.B.A. have recently set up a Standing Committee to make a general review of Building Acts, Bye-laws and Regulations in England and Wales including Model Building Bye-laws. Their report cannot be less exhaustive than the report on Scottish Building Law.

Bridging the Gap

At the close of the joint symposium on 'Gaps in Building Know-How' held at Alston Hall, Longridge, last December, hope was expressed that there would be further similar occasions for discussion of points which had arisen.

The Council of the Preston, Blackburn and District Society of Architects have therefore consulted the North-Western Federation of Building Trades Employers, the Lancashire, Cheshire and Isle of Man Branch of the R.I.C.S., and the Building Centre, all of whom have agreed to take part in a second symposium, 'Bridging the Gap', which will be held as before at the College of Further Education, Alston Hall, on 6–8 December. Alston Hall is six miles from Preston.

The principal speakers will be the President of the Preston, Blackburn and District Society, Mr. Tom Mellor, A.M.T.P.I. [*A*], Mr. W. A. Allen [*A*] on 'Trial and Error', Mr. Richard Sheppard [*F*] on 'A Grammar for Modern Building', Mr. Howard A. Close, M.A., Contracts and Legal Adviser to the N.F.B.T.E., on 'Bound by Contract', Mr. K. J. Speakman-Brown, F.R.I.C.S., on 'Counting the Cost', and Mr. L. Statham, President of the North-Western Federation of Building Trades Employers, on 'Profit by Experience'. The summing-up will be done by Mr. Eric L. Bird [*A*]. Charges are, Friday evening to Sunday lunch, £2 12*s.* 6*d.* Non-residential, two days, £1 12*s.*

Members who wish to attend should notify the Hon. Secretary, Mr. F. A. Hewitt [*A*], The Mount, Marshalls Brow, Penwortham, Preston, by 21 November, enclosing a booking fee of £1.

The Design of Physics Laboratories

A symposium on 'The Design of Physics Laboratories', organised by the London and Home Counties Branch of the Institute of Physics, will be held in the lecture theatre of the Royal Institution, 21 Albemarle Street, on 27 November at 2.30 p.m.

Among the speakers will be Mr. Basil Spence, Hon. Secretary, R.I.B.A., and Dr. R. G. Hopkinson, of the Building Research Station. Admission is by ticket only, obtainable from the Institute of Physics, 47 Belgrave Square, London, S.W.1.

Mr. Anthony Touzeau Williams [*A*], who will take up his duties as Secretary of the Science Committee and Technical Editor of the JOURNAL at the beginning of December.

Building Exhibition

The November issue of the Monthly List of New Materials published by the Building Centre, will be in the form of a guide to new products being shown at the Building Exhibition.

The new products will be listed in order of stands, to save visitors' time when visiting Olympia.

Models of Buildings for Blind Children

It is a difficult thing for a blind child to get a mental image for such a large object as a house. Condover Hall School for the Blind is undertaking a study this term entitled 'Homes and Schools', and models which the children could touch would be of the greatest assistance to them.

Members who have models of buildings that they no longer want to keep could do a great deal towards making the children's studies of real interest and value by sending them to the Principal, Mr. S. O. Myers, B.Sc., Condover Hall, Condover, Shrewsbury, Shropshire, who will be very glad to have them.

A note giving the scale of the model and something about the building it represents would probably be of help to the staff.

The Price of the Journal

It has been found necessary to increase the price charged for a single copy of the JOURNAL from 2*s.* 6*d.* to 3*s.* 6*d.*, and postage is now 7*d.* on each copy.

The annual subscription has had to be raised from £1 16*s.* a year to £2. For Probationers and members of Allied Societies it will now be £1 8*s.* instead of £1 4*s.*

Council Business

A meeting of the Council was held on 8 October, Mr. Kenneth M. B. Cross, President, in the Chair.

It was reported that at the International Union of Architects Assembly held in Paris in August it was decided to postpone the 6th International Congress, which was to have been held in London in 1959 at the invitation of the R.I.B.A., to 1961.

The Council accepted the invitation of the South Wales Institute of Architects to hold the British Architects' Conference at Cardiff in 1959.

Formal approval was given to the award made by the Jury of the Northamptonshire, Bedfordshire and Huntingdonshire Association of Architects of the R.I.B.A. Architecture Bronze Medal in the area of the Association for the three-year period ending 31 December 1956 in favour of the Nuffield Diagnostic Centre, Cottingham Road, Corby, Northants, designed by R. Llewelyn Davies, M.A. [*F*].

The Council have appointed Mr. Anthony Touzeau Williams [*A*] as Assistant Secretary, R.I.B.A. (Building Science and Technology).

Mr. Williams was educated at Cranleigh School and the Architectural Association School of Architecture. After qualifying he served as a Senior Assistant Architect to the Hertfordshire County Council, and since 1955 has held a post at the British Standards Institution as Technical Officer in the Modular Co-ordination Study Team and as a Committee Secretary.

The Advisory Committee set up by the London County Council had asked the Institute to make observations on a number of matters in connection with London Building Bye-laws. The preparation of the Institute's observations was entrusted to the Committee on Bye-laws and Building Regulations. These observations have now been sent forward.

It was also reported to the Council that, in forwarding these observations, the Executive Committee had added in a covering letter the Institute's adherence to the view already expressed that any waivers in connection with London Building Bye-laws should be dealt with by a central authority so that a body of experience and information might rapidly be collected and be available at some central source.

The Council approved this expression of opinion and left it to the Institute's representative on the L.C.C. Advisory Committee to press it in the course of further deliberations.

After considering a memorandum prepared by the Officers of the Practice Committee, the Council confirmed that the Royal Institute supported the principle of firm price tendering. It was agreed to urge that, wherever circumstances are favourable, firm price tenders should be invited, it being understood that such an invitation did not infer any additional conditions of contract apart from those customarily contained in the R.I.B.A. Standard Form of Contract.

The Council also approved in principle a recommendation of the Town and Country Planning and Housing Committee that a one-day conference on private enterprise housing entitled 'Design Pays' should be held at the R.I.B.A. early in 1958. Other notes from the Minutes appear on page 32.

R.I.B.A. Diary

WEDNESDAY 13 NOVEMBER, 6 p.m. R.I.B.A. Library Group. Illustrated talk on Victorian Manchester by Mr. Cecil Stewart [*F*].

The Architecture of Serbia*

By Cecil Stewart [*F*]

IT MIGHT BE THOUGHT that the architectural historian has at least one advantage over the coal-miner, for the material with which he works is never likely to be exhausted. Indeed, as long as buildings go up, there should be material for the historian to set down. Nevertheless, he is rapidly catching up with his subject and, like the miner, is now forced to stir up old stones; or alternatively he must introduce as subjects for study works which have only recently been completed—placing in historical perspective designs which are scarcely beyond the 'perspective' stage. This is, of course, an exaggeration, but it is nevertheless true that nearly all the major architectural works in European history have already been classified, dated, drawn and photographed; and while it is still possible to throw new light on their greatness, the basic survey has been completed.

There remains, however, one area in the heart of the Balkans which has not been surveyed. T. G. Jackson, in his studies of the architecture of the Dalmatian coast, literally skirted the subject; but then, by a strange perversity, the Balkan states in the Victorian age of peace were a centre of war, whereas today, when wars are commonplace, the Balkans are at peace, and in the case of Serbia, are more easily accessible than they ever were.

That Serbia made any contribution at all to the sum of architectural history will come as a surprise to those whose knowledge is limited to the standard textbooks.[1] That Serbia made a contribution to art history has only recently been recognised. At the beginning of this century, knowledge of the very existence of Serbian art was limited to a very few continental scholars. It is only since the exhibition of reproductions of Yugoslav medieval frescoes in the Tate Gallery in 1953 that the interest of the English public has been stirred; but the architecture which enshrines the originals is still largely unknown and unrecorded.

The earliest studies of Serbian architecture were made by Serbs who, after 1912, were fired with enthusiasm for their newly-achieved freedom from Turkish dominion, and classified their architecture under the names of their kings, in much the same way as we classify French architecture of the Renaissance by the titles *François Premier*, *Louis Quatorze* and so on. This, though logical in the sense that it presented a chronological sequence of building, paid little regard to stylistic differences occurring in different regions.

The studies that followed were nearly all the work of the French art historians Millet and Diehl, but their interests lay chiefly in the paintings which adorned the churches, and they saw the various architectural types as the product of certain schools associated with the paintings. The basis of this idea was that 'churches were developed virtually as great frames for the paintings inside them'. This view (with which I do not concur) complicated matters, for some of the paintings, though by the same artist, were in buildings of entirely different character. Confusion was thus added to confusion. Both Serbs and French had followed the conventional Western approach of seeing art and architecture as a logical process of development, each generation adding to the common fund, as, for instance, we in England trace the evolution of the Decorated style from the Early English, and the Perpendicular from the Decorated. Both disregarded the fundamentally conservative character of the Byzantine world with which Serbia was associated. Both disregarded the importance of geography.

Far from considering Byzantine architecture as a development, it might more reasonably be regarded as a regression, for without question its greatest achievement was the church of Sancta Sophia at Constantinople; and this is one of the earliest Byzantine buildings. Nothing succeeded equal to Sancta Sophia. What matters is that at Sancta Sophia a theme had been discovered upon which many variations might be played. The leit-motif was the dome, which marked a vertical axis and to which everything else was subsidiary. This was poised like an arc of the firmament, to which the eyes of the worshippers were transported. 'As the eye wanders round, it seems to gaze on the encircling heavens', wrote a contemporary. In the centre God the Son, Pantocrator, gazed down in awful, terrifying majesty. Immediately below, in the pendentives, were the Evangelists, inscribing the Words of God. Below them, round the walls, were representations of the saints and the angels, a concerted hagiology, a veritable heaven on earth. This wondrous creation of Sancta Sophia provided the inspiration and the exemplar for all that followed. In the succeeding centuries only one slight modification was made. Heaven, symbolised by the dome, was raised higher on a circular shaft, which would accommodate representations of the Apostles of God and, at the same time, provide a more convenient system of lighting; for by raising the dome upon a drum it was possible to introduce windows on the vertical face and save breaking into the surface of the dome.

Upon this system of pendentives, drum and dome, the whole of Byzantine architecture is based. For a thousand years and more, religious architecture in the Near East played upon this theme, sometimes with elemental simplicity, like a tune picked out with a single finger, or occasionally with intricate counterpoint, but never, never with the full symphonic splendour of the mother church.

Much paper has been covered in an endeavour to trace the origin of the architecture of Sancta Sophia.That it was by the direct inspiration of an angel, who advised Justinian and played the part of a supernatural clerk of works, was a sufficient explanation for the contemporary historian, Procopius, but not for the historian of this present age. Some see the source in the great domical constructions of the Romans; others seek origins in Syria or Sassanid Persia. Few, so far as I know, have seriously considered that the germs of the style might be observed in the neighbourhood of Serbia, in that great palace which Diocletian built at Spalato (Split) on the Dalmatian coast. And yet it was Diocletian who, more than any other, laid the foundations for the survival of the Roman Empire; who re-established imperial authority, borrowing from the Sassanid court Persian conceptions of absolute sovereignty which were to be maintained throughout the life of the succeeding Byzantine Empire. Diocletian had made the first move eastwards from Rome. It only remained for Constantine to complete his work by establishing the centre of administration farther east, at Byzantium.

It is convenient to link the foundation of the Byzantine style with the foundation of Constantinople. This, paradoxically enough, assumes that Byzantine art begins when Byzantium ceased—officially—to exist. But it is an over-simplification. The elements of the Byzantine style are to be found before Constantine became Emperor, before Christianity was recognised. They are to be found in the catacombs of Rome and in the third-century palaces of Serbistan and Firouzabad; they are also to be found in Spalato.

It is at Spalato, in the peristylum, that the structural principles of Greece and Rome were successfully combined—the arch springing directly from the capital without an intervening architrave. It is in the Porta Aurea that little arched colonnettes were used, perched on brackets, to become a decorative screen in the manner of Theodoric's Palace at Ravenna and the Porphyry Palace at Constantinople. And it is here, in the so-called Temple of Jupiter (now the Cathedral), that a dome was constructed on new and revolutionary principles. For in place of massed concrete, or radiating rings of masonry, the dome is built of light material set on little squinch arches mounting upwards. This device, used across the corners of a square, provided one solution—though not a perfect one—to the problem of constructing

* Awarded the R.I.B.A. Essay Prize, 1956.

[1] Fergusson, Simpson, Banister Fletcher, Sturgis and Fotheringham, etc., make no reference to Serbian architecture. J. A. Hamilton, in his *Byzantine Architecture and Decoration* (1933), devotes a chapter to Slavonic architecture, but the information he gives is not the result of first-hand study and he omits many of the more important monuments.

a dome over a square space. It occurs again and again in Byzantine architecture, in Constantinople, Greece and Sicily. It was the means by which the very early domed churches of Dalmatia, at Nin, Zadar, Knin and in Spalato itself, were constructed.

At what date these churches were built or Christianity first came to the Balkan states, is not known. The Romans had conquered the Illyrian coastal strip in the first century, and one may assume that Christianity followed in the fourth century, as it did in England. But, as in England, the advent of Christianity was succeeded by Dark Ages in which the land was subject to invasion by barbarian tribes. Between 500 and 800 the history of the Balkan kings is as confusing as the history of England under the Heptarchy; but by 867 there existed a State of Macedonia, a Kingdom of Montenegro, a leader of the Croats, who had been crowned by the Pope at Rome, and a Serbian ruler whose son was later to be crowned by the Patriarch at Constantinople. In the East there was a mighty Tsar of Bulgaria, and in the south-east a weakening Byzantine Empire, already threatened on its Asiatic frontiers by the growing Muslim power.

These kingdoms were almost continually at war with each other, and their frontiers were perpetually changing. The 'little Serbia' for which we fought in the Great War was in fact a considerable geographical area; it was called 'little' only because it had once been bigger. And when we talk of Serbian architecture, we mean that architecture which is found in the lands peopled by the South Slavs in the heart of the Balkans. At one time they were subjects of their own kings, at another they were subjected to other rulers, at another they subjected others to their rule; most of the time with which we are concerned here, they were subject to the cultural influence of their Byzantine neighbours.

Classification of the architecture is just as complicated. But, as I hope to show, there are four distinct regions in which certain characteristics predominate. They are Raška[1] in the centre and south-west, Macedonia in the south, Kosmet between Raška and Macedonia, and Morava in the extreme north[2] (Fig. 1). These districts are not determined by the limits of historical kingdoms or by artistic periods. They occur within an historical framework, and the buildings were adorned with pictures which have special characteristics arising out of the architecture; but above all, the basis of classification is geographical.

The historical story begins in 867, when two missionaries, Cyril and Methodius, were sent from Constantinople to spread the Gospel, and at the same time secure allegiance to the Byzantine state. It is likely that political, rather than religious,

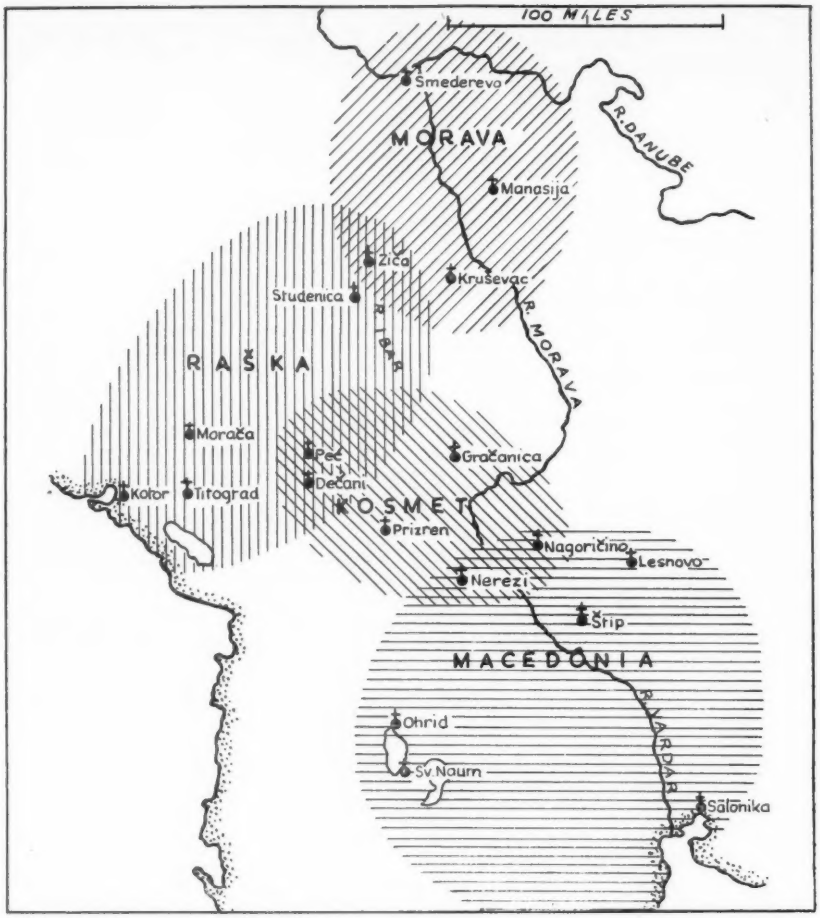

Fig. 1. Map showing principal regions of architectural development and places examined by the author

motives were paramount in this enterprise, for ever since the coronation of Charlemagne in 800 the Balkans had become a potential battleground between East and West—between the Pope and the Patriarch. Already, along the Dalmatian coast the Catholics had established their Church. Between A.D. 900 and 1100 the remaining territories were converted to the Orthodox rite. Of this early period there are few, if any, architectural remains. So far as this study is concerned, it is not until the establishment of the Nemanyid dynasty, towards the end of the twelfth century, that conditions existed for the building of permanent churches.

The early kingdom of the Nemanyas was centred at Raš in the heart of Serbia, and extended south-west to incorporate Montenegro and a small strip of the Dalmatian coast. It was subject to influence from the West as well as from the Byzantine world, with the result that the architecture combines Western and Eastern characteristics. It is an architecture which integrates the horizontal axis determined by a long nave and the vertical axis determined by a dome. This is the architecture of the so-called Raška school, and it is to be found only in this region (Fig. 2). It can be seen at its simplest in the little church of Sv. Luke at Kotor (Cattaro), which was built in 1195, at its finest in the monastic church

Fig. 2. Type of church found in the Raška region

[1] *Notes on Serbian pronunciation*
c is pronounced as the *ts* in bats.
č or ć is pronounced as the *ch* in charm.
h is pronounced as the soft *ch* in loch.
j is pronounced as the *y* in yet.
š is pronounced as the *sh* in smash.
N.B. Sv. is short for Sveti (Saint).

[2] I am indebted to A. Deroko, who defines these regions in *Architektura u Srednievekovnoy Srbiyi* (Belgrade, 1953).

of Morača (1252) and at its most complicated in the church at Dečani (1327–35).

Kotor lies pressed against the bare mountains of Montenegro, facing west to Italy but gripped close by medieval walls to the mainland. Its little church is no more than a box topped by a tiled roof, which is pierced about the centre of its length by the conical capping of a dome little more than ten feet across (Fig. 3). Nothing could be simpler. Inside there is just a nave, divided into three by two arches which, curiously enough, are pointed. These arches carry the pendentives and the pendentives carry the dome. There are no frescoes, just plain whitewashed walls, and a semicircular apse at the east end. The whole building is not more than thirty feet long, significant for its age, its simplicity and, perhaps, as a precursor of a style.

The road from Kotor weaves up the mountainside until it reaches that barren, stony world which is Montenegro—the ancient kingdom of Zeta. Here, alas, when God was making the world and flying across its surface to distribute the various elements, His bag of stones broke. There is no architecture, in spite of the abundance of rubble. One must go farther inland and up the valley of the Morača, to an almost Alpine setting, to find the most westerly of the great painted churches.

The core of the plan of the monastic church of Morača is identical with that of Sv. Luke, but to this there are added a small transept on each side, a couple of small chapels at the east end and a considerable narthex equal in size to the nave (Fig. 4). The provision of a large narthex is one of the most interesting and peculiar features of Serbian architecture; it is not to be found in other Balkan lands. Its purpose is obscure. Certainly it provided additional and extensive surfaces for mural decoration. In medieval times it may have served as a Chapter House; today it functions largely as a store room. As a rule the narthex was the last part of the church to be built, but in the Raška school it never appears, from the outside, as an annexe, because it is incorporated under an extension of the church roof, so that the building has unity, but is slightly longer than is normal in Byzantine churches.

By reason of its considerable areas of flat wall, the architecture of the Raška school was ideal for fresco decoration on a monumental scale. It is not my purpose here to consider the great contribution made by the Serbs in this field; that has already received, and is still receiving, the attention of highly skilled art historians. It is, indeed, because so much thought has been given to the decoration that the architecture is regarded merely as a receptacle. One is led to believe that the architecture was predetermined only to accommodate the pictures; that, however, is to put the cart before the horse. It is true that there was a general ikonographical scheme which was usually applied to all Byzantine churches, but apart from the prescribed arrangement in the dome, drum and pendentives and in the conch of the apse, there was room for much variety. Certain pictures, as, for instance, the Assumption of the Virgin, or the Nativity, had to appear in certain locations, but the shape of these compositions, and their extent, was rigidly determined by the architecture. As the design of the churches increased in complexity, more and more new subjects found a place on the walls. If the areas were large, the figures in the compositions were large. If the wall areas were exceptionally tall and narrow, the figures were depicted with like attenuated verticality. Always there was a harmony between the architecture and the decoration —but the architecture came first and set the scale. It is perhaps surprising that a great art should have developed at all, when one considers the architectural limitations and the even more exacting restrictions of the 'Painter's Code'.

The church and its decoration were equally parts of the whole—the whole being the Kingdom of God on earth. The architecture inspired the painter and the paintings became possessed of something of the quality of the building. An examination of a single painting, or of a reproduction, can give no idea of the essential quality of Byzantine art. It is only when one is within a Byzantine church, enveloped, as it were, by paintings which conform to architectural shapes and are seen across defined spaces, that the content can be appreciated. Byzantine architecture is much more than a container for the thing contained. Omit the paintings altogether, and there will still be a structure of considerable interest; but people the walls and the vaults with those mysterious, unearthly saints, depicted with elongated figures and almost emaciated faces, and the whole assumes a character that is supremely transcendental.

For sheer extent of painting there is no church equal to that of the monastery of Dečani, where there are more than twenty series, or cycles, of fresco. The Passion is described in forty-three incidents, Genesis in forty-six; the Last Judgment has twenty-six scenes, and there is a Divine Calendar of three hundred and sixty-five pictures. It is the perfection of the strip cartoon. It is not just a great illuminated book translated into interior decoration for the convenience of the illiterate, as it has been described by others; it is—if the analogy can be excused—a gigantic 'comic', elevated from twentieth-century banality to the highest realms of art.

The church of the monastery of Dečani is the largest in Serbia, and shows more clearly than any other the combination of Eastern and Western motifs which are a

Fig. 3. Sv. Luke, Kotor

(photo: John Newal

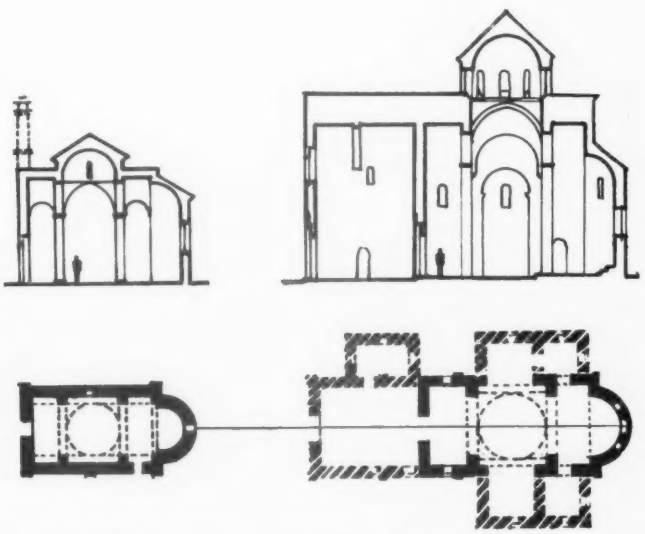

Fig. 4. Left: Sv. Luke, Kotor. Right: Church at Morača

(information from A. Deroko)

characteristic of the Raška school. There are aisles to the body of the church and to the narthex; there are ribbed vaults, and much sculptured decoration; the doorways are built in Orders, in the Romanesque manner, and there are many features, like the arcaded corbel tables under the eaves, which hark back to Lombardy and which find an echo all along the Dalmatian coast (Fig. 5). The architect was, in fact, a Dalmatian: Fra Vita, of Kotor. Dečani is built of two marbles, white and rose, laid in layers in the manner so admired by George Edmund Street in his studies of North Italy. Without question, it is more lavish and extravagant than any other Byzantine building of the period. It must be remembered that Serbia at that time—the first half of the fourteenth century—was the greatest power in Eastern Europe. The Bulgarians, the Macedonians, the Albanians, had all fallen to the Serbs; in fact, all the Balkan lands except Thrace, the Peloponnese, Dubrovnik and Salonika had become part of Serbia. It was no longer merely a kingdom. In the presence of two Patriarchs, a Serbo-Roman Empire was inaugurated, and Stefan Dušan was crowned Tsar (1346). The splendour of Dušan's coronation, with all the trimmings, the cloth of gold, the purple and the jewels, was universally acknowledged. It far surpassed the magnificence of that of the Byzantine Emperor, John Cantacuzenos, in the following year, when a contemporary historian spoke contemptuously of a crown of gilded leather and jewels of coloured glass, and a banquet at which the admirers drank from beakers of tin and lead. The contrast was a real one. Ever since the Latin occupation of Constantinople (1204–61), the Byzantine Empire had been in decline. It was not just a coincidence that Serbia should be in the ascendant; for Serbia's gain was simply the Byzantines' loss, the Serbs having gained those lands which they had forced the Byzantines to relinquish.

Dečani is regarded as one of the finest monuments of Serbo-Byzantine art, though it is confusing architecturally because of the number of purely Romanesque features which it incorporates. Some of these have already been mentioned. The most interesting is the sculpture. Religious figure sculpture is relatively rare in the Byzantine world, largely because three-dimensional personifications seemed, to the Eastern mind, to savour of idolatry. But at Dečani, in the tympana over the entrance portals, there are fully formed carvings which can be paralleled in Romanesque churches throughout Western Europe. Similar sculptures occur in the narthex of the monastery of Studenica, north of Raš, which was completed in 1330. The resemblance between the carvings is so great that I imagine they must be the work of the same craftsman.

Between 1346 and 1371 Macedonia was a part of the Serbian Empire, and this fact alone might justify its inclusion within this survey. But in addition it is hoped to show that the native architecture of Macedonia exercised a considerable influence on subsequent architecture in Serbia proper. The Macedonian style is the most perfect of all latter-day Byzantine architecture. The churches are minute, and conform to a pattern known as the cross-in-square.

The basis of this pattern is a square, or nearly square box, having in the centre a dome raised above a high drum, supported on four detached piers or columns, which define an inner square. From this square, and level with the base of the drum, four arms project, leaving four smaller squares at each corner of the building which are roofed at a lower level. The building thus has a square ground plan, but is cruciform above. In addition, there are at the east end a projecting apse, and at the west end a porch or narthex (Fig. 7).

It is unnecessary to trace here the origins of this plan.[1] The style had already reached perfection at Sv. Naum, on the shores of Lake Ohrid, in the tenth century, and it recurs in the centuries which follow with only minor variations, all over Macedonia and indeed throughout the whole of the Greek world. The modifications are so slight that to describe one church is to describe all.

The church of Sv. Klimente, which is situated above the town of Ohrid but below the towering walls of Samuillo's fortress, is typical. It was begun in 1295 and is constructed almost entirely of brick. The recent discovery in this church of the original frescoes, beneath successive layers of overpainting and varnish, so stirred ikonographical historians that the study of the building itself has been neglected. Yet it is, in its way, as perfect a casket as could be devised. It is richer far than the great churches of Constantinople. There is a sparkling, jewel-like affinity between the inside and the outside, which is notable but difficult to explain; for the external effect seems to have been simply achieved by the application of the most elementary geometry in the laying of bricks, tiles and stones, while the inside is rich with all the complexity of an art imbued with the deepest Christian significance. The affinity is there, nevertheless, as it is in other churches in Macedonia. Sometimes the ornamentation appears as the simplest superficial pattern-making, as, for instance, in the arched panels at the sides of the little lakeside church of Sv. Zaoum; but usually, and more perfectly, as at Sv. Klimente, the pattern is tightly laced into the structure, with regular courses, so that it appears to have a constructive basis as rigid as are the embroidered patterns on the costumes of the people (Fig. 6).

It is easy to see the connection between the style of the architecture of Macedonia and that of 'Kosmet' (Kossovo-Metohia). The cross-in-square plan remains, but over each of the corners supplementary domes are raised, miniature editions of the central dome (Fig. 8). There is, too, in the later examples, a marked tendency for the whole structure to get taller in proportion, so that the cupolas on the corners, which are only a few feet in diameter, become the merest turrets.

The earliest example of the style is to be found in the church of Sv. Panteleimon, Nerezi, near Skopje. It was built in 1164, and the narthex was added shortly afterwards. There is not seen as yet a vertical emphasis, nor are the corner turrets faithful echoes of the central cupola. The centre is an octagon with a conical roof, while the corners are square brick boxes roofed by tiles which roughly follow the curvature of the domes. There is, indeed, a rough uncertainty about the whole design. The central apse is clearly defined, but at the sides there are supplementary apses

Fig. 5. Dečani; detail of east end

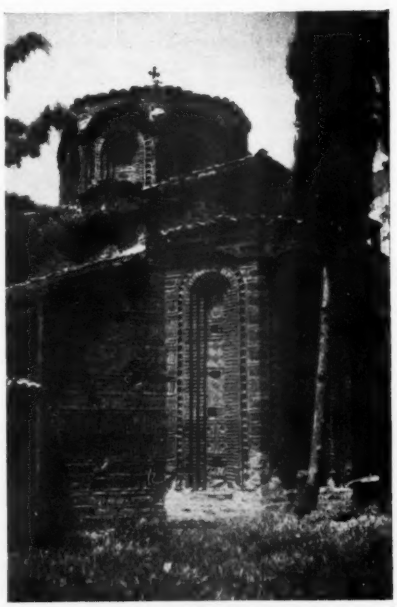

Fig. 6. Sv. Klimente, Ohrid; detail of east end

[1] This was, and remains, a controversial subject. *Vide* Strzygowski: *Origin of Christian Church Art*, English trans., 1923; Millet: *L'Art Byzantin*, 1905; and Rivoira: *Roman Architecture*, English trans., 1925.

which break the wall surface of the east end in a most indeterminate way (Fig. 9).

The church of Sv. Djordje at Nagoričino, near Kumanovo, which was rebuilt in 1313, provides a more mature version of the style. Here the structure is clearly expressed. There can be no doubt of the parentage of the corner domes, which are set like children in a family group. The cross plan is defined with certainty, and brick arches mark the lines of the barrel-vaulted interior (Fig. 10).

It was here, by this tiny church, that the Serbian army gathered in 1912 on the eve of the Battle of Kumanovo, at which Serbia regained her freedom from Turkish domination. After the battle the army marched north to Kossovo. Kossovo is holy ground to the Serbs, for on this field they were disastrously defeated by the Turks in 1389. When the troops from Kumanovo reached Kossovo, they fell on their knees and kissed the sacred soil of the newly liberated plain; and when they rose again they instinctively marched across it softly, on tip-toe, in order not to disturb the sleep of the heroic dead. Close by there stands the most famous church in Serbia: Gračanica. Here the Tsar Lazar, five hundred years before, had prayed with all the nobility of Serbia on the eve of their martyrdom.

The church (*c.* 1318) is worthy of its site. Architecturally it marks the culmination of the Kosmet style. The plan is a square within a square; the structure, a church within a church. It is as though the conventional central dome had been removed and in its place an entire new church had been raised. Below, at the corners of the surrounding structure, there are subsidiary domes set up like pepper-pots in some gigantic, monumental cruet. It is none the less a delightful building—a joyful extravaganza (Fig. 11). Inside, everything is exaggerated. The saintly denizens on the walls are attenuated out of all reason. No longer is the interior a vast space overcanopied by the dome of heaven, as at Sancta Sophia; it has become a series of high, interrelated spaces capped by the merest shells, which the eye reaches as through a diminishing glass. The reality of heaven must have seemed farther away, too, as the terror of the infidel approached the Serbian realm.

It was in 1354 that the infidel, Suleiman, captured Gallipoli and endangered not only Constantinople but the whole of the Byzantine world. The Tsar Dušan of Serbia

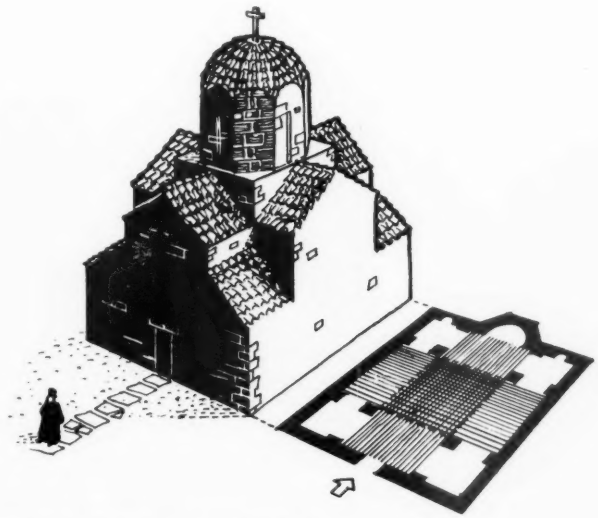

Fig. 7. Type of church found in the Macedonian region

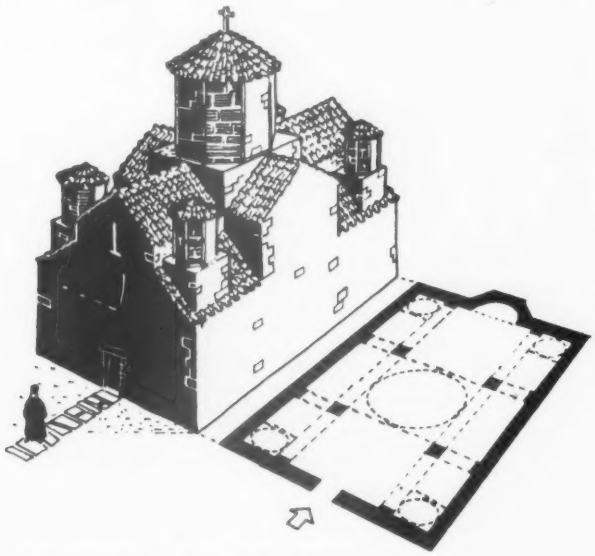

Fig. 8. Type of church found in the Kosmet region

Fig. 9. Sv. Panteleimon, Nerezi *photo: John Newall)*

Fig. 10. Sv. Djordje, Nagoričino

chose this occasion to plan a conquest of Constantinople and thereby achieve an empire of a strength sufficient to repel the common enemy. While he was gathering his forces together, he died, leaving a young man as his heir. It was tragic that at this moment there should have been disputes about the succession, with the result that the country split into a number of separate kingdoms; and it was tragic that, at the same time, the Bulgarian and Byzantine Empires were consumed by civil wars and divided by heresies. The way, therefore, lay open for the Turkish conquest of the Balkans, but for seventy years after Kossovo Serbia continued to exist, after a servile fashion, until the Battle of Smederevo destroyed all hopes of even a semi-independent state.

It was during these last seventy years, that is, from 1389 to 1459, when the Eastern world was embroiled in the most bitter and bloody struggle, when the Western world was enjoying a renaissance of art and learning, that Serbia made her last and most original contribution to the sum of Byzantine architecture. This architecture, this regional variation, occurs only in the lands watered by the river Morava, and all are agreed in calling it the Morava style. The basis, as ever, is a central dome over a square space, but supported by apses crowned with semi-domes, which project to the north, east and south, resulting in a trefoil plan (Fig. 12). To support a dome by semi-domes is not in itself original; such a system was the supreme achievement in the building of Sancta Sophia. Nor is the trefoil plan an innovation; at Nin, to the north of Split, there are ruins of a ninth-century church of precisely that pattern,[1] and there are other examples in Armenia and on Mount Athos. Nevertheless, there are features of the Morava style which distinguish it from precedent. They are the exceptional vertical emphasis, the richness of the external decoration and the strange admixture of Eastern and Western motifs.

If we look, for instance, at the Lazarica Church at Kruševac, we are confronted with rose windows, arcading, string courses and carved decorations, all of which belong to the Gothic or Romanesque world; and with brick and stone, arranged in stripes, which are characteristic of some of the finest Byzantine architecture in Greece. The product is not, at Lazarica, entirely felicitous. The combination of creamy-coloured stone, pinky-red bricks and chequered and carved patterns, results in a piece of architectural confectionery which is not to everyone's taste. It is colourful and gay, but not easily digested. Even if bereft of its colour and denuded of its ornamental trimmings, the general composition would not be satisfactory. The central drum is too tall, and competes with the tower over the narthex; the horizontal string courses conflict with the vertical lines and give an unfortunate storied effect. (Fig. 13). Altogether there is an embarrassment of riches and little foretaste of the qualities that were later to develop at Ravanica and Manasija.

[1] Illustrated in *Early Church Art*, p. 16, by Joseph Strzygowski, 1928.

Fig. 11. Gračanica

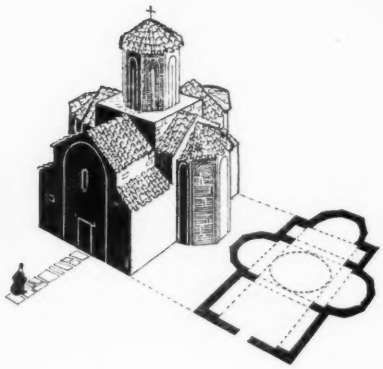

Fig. 12. Type of church found in the Morava region

Fig. 13. Lazarica Church at Kruševac

Fig. 14. Manasija; view from south-west

These are fortified monasteries, and lie farther north and far from any town. They are the last strongholds of Orthodox monasticism in the Balkans. Manasija, in spite of attempts at restoration in 1928 which resulted in the destruction of most of the battlements, is the more impressive. First, one is confronted by a moat; second, by fortified outworks and a wall forty feet high, reinforced with great towers at regular intervals; third, by a flowery courtyard, and fourth, by a wonderfully elegant church. Nowhere in the Byzantine world is there such a beautifully preserved sequence as this, and nowhere can one find such a formidable shell protecting such a delicate nut (Fig. 15). Manasija is the supreme example of the architecture of the Morava valley. Six perfectly detailed cupolas are elevated above the complex roof system. They reach even higher than the surrounding walls, so exaggerated is the vertical emphasis. Within the courtyard it is difficult to get a complete view of the church. The walls are built of fine ashlar and capped with arcading. They are severely plain, except for the colonnettes which mark the angles of the apses. The windows are unusually generous in their width—a feature which was obviously made possible by the presence of the enclosing fortifications. The windows of the cupolas, on the other hand, are the merest slits surrounded by a series of arches, each set out from the last so that on plan they form a pattern of stars (Fig. 14).

In some special way, Manasija seems to express the conflict of its period. There is the sweetness of the cupolas, which arise

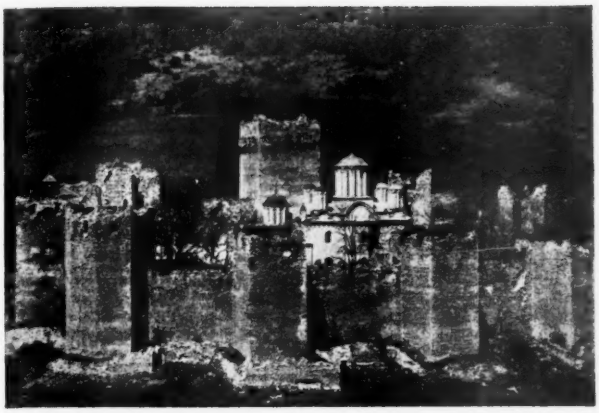

Fig. 15. Manasija
(photo: Zavod za Zastitu Spomeniko Kulture N.R. Srbije)

Fig. 16. Manasija; warrior saints
(photo: Zavod za Zastitu Spomeniko Kulture N.R. Srbije)

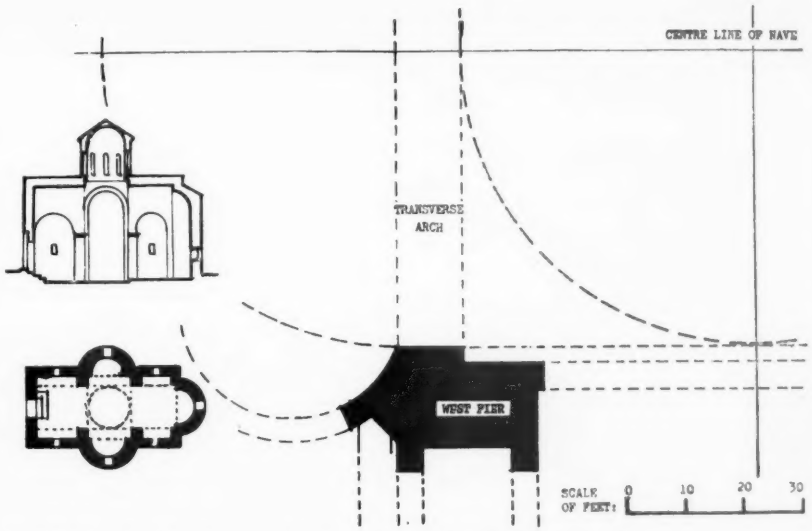

Fig. 17. Church at Smederevo and part plan of Sancta Sophia to same scale

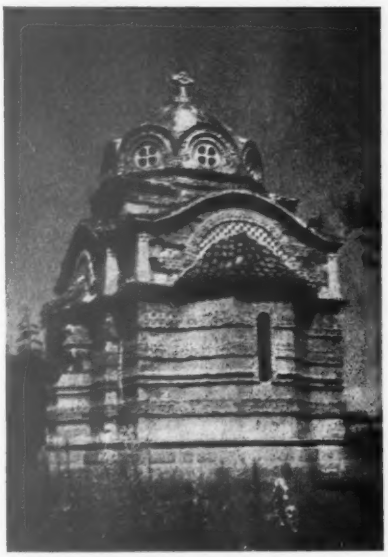

Fig. 18. 18th-century church near Kačanik

with elegant precision from the simple mass of the building; there is the contrast between the church and its formidable enclosure; and inside the church itself there is the dichotomy of the almost ethereal representations of traditional religious figures and the swaggering warrior saints which line the lower stages of the walls (Fig. 16). This glorification of the fighter is an interesting feature of latter-day Byzantine art. There is nothing like it in Western art; S. George and S. Joan are our only combatants. But, except in Spain, the West did not face the infidel and the need was never so acute. The miserable Dependency of Serbia was fighting a losing battle. The warrior saints, like the Serbs, were equipped with out-of-date weapons; the Turks had gunpowder and the cannon. A secret alliance with Hungary proved to be valueless. A last desperate appeal was made to the Pope, even by offering the country to him. After the fall of Constantinople in 1453 there was little hope left. On the Danube, at Smederevo, the last Serbian ruler, Durad Brankovic, prepared for the final assault. His designs for the fortification of Smederevo were based on the only plans he knew—those of Constantinople; but these had already succumbed to the Turkish cannon. Nevertheless, the stupendous walls of Smederevo still stand, and the reason is part of the tragic Serbian story; for Smederevo fell not by direct attack, but by treachery, and after its fall the fortress became the most formidable link in the chain which held the Serbian peoples under Turkish domination for over four hundred years.

It is the most impressive monument of its kind, and it is not surprising that when it was built the Serbs should have little time for the erection of churches. There is, however, in a cemetery on the hillside above the town, one little brick and stone church, perfect in its way, and no larger than Sv. Luke at Kotor. The essence of the Morava style persists in the trefoil plan and the dome raised high at the crossing; but because it is so small it might, by Western standards, seem pretentious to call it a church.

Nearly all the latter-day Byzantine churches are small. Even Dečani, the largest of the Serbian churches, would not be considered extensive when compared with a typical English parish church. The majority are no larger than a three-bedroomed house, and some are so small that their total floor area is about equal to that of a normal living-room. The whole plan of the church at Smederevo could almost be contained within the plan of one of the four piers which support the dome of Sancta Sophia (Fig. 17).

Perhaps one should be thankful that the Byzantine churches other than those of Constantinople and Salonika were so small, for they were small enough not to be noticed by the Turks. Only the larger buildings were converted into mosques.

The smaller churches, especially if they were outside the towns, were allowed to remain; and Christianity continued to be practised in spite of Muslim domination. Even a few new churches were built, but these are rare. Nearly always they are to be found outside the towns and they are seldom imposing architecturally. There is, for example, a mile beyond the town of Kačanik, a little church of the eighteenth-century, built on the Morava plan, which is a most curious confusion (Fig. 18). It is not so much an example of Byzantine revival as of Byzantine Baroque. The elements of the style have, in a strange way, been interpreted anew. It is an astonishingly sophisticated little building, almost a Folly. It illustrates, none the less, the persistence of the centralised plan, but it is a survival rather than a revival.

The revival of Byzantine architecture was sadly brief. It began in 1912 when King Peter started the building of a vast marble church at Topola, near Belgrade, which was intended as the last resting-place of the kings of the new regime. It was only completed in 1939. The example was followed by the building of other monumental churches in the larger towns, and some of these were never finished and are not likely to be finished now. They survive, like relics of war damage, in areas not urgently required for new buildings; for the advent of Communism has not been destructive. There are no anti-God museums. Religious observance is permitted, even if it is not encouraged. The Church has, however, lost its traditional political significance.[1]

Still the monuments remain. For nearly three centuries (from the end of the twelfth to the middle of the fifteenth) Serbia was more productive of great art than any other country in the Eastern world. In the field of fresco painting, her importance has at last been recognised.[2] Architecturally it has scarcely been noticed. Yet the contribution is notable, as it is hoped this essay may have indicated. The little churches of Serbia may be remote in time and place; they may lack the monumental grandeur, the pomp and the magnificence which are so commonly associated with greatness; they may seem trifles when compared with S. Peter's or Beauvais or Sancta Sophia. They possess, nevertheless, something of that quality which transforms a collection of building materials into a coherent structure and which we call Architecture. In spite of their littleness, they have a dignity and a style which should not be completely disregarded. That it was a style which had no effect on the main train of architectural development is acknowledged. If the architecture of Serbia were destroyed tomorrow, the loss would not affect the coherence of architectural history; for Serbian architecture is only a digression, a Byzantine *cul-de-sac*. At the end, one can only return. To show, however, that the excursion was worth making has been the purpose of this essay.

[1] It is perhaps difficult for the Western mind to appreciate the active political role played by the Church in the Greek Orthodox world. Ever since Constantine united Christianity and the State, the Church played an important part in secular affairs. In Serbia the greatest churchmen were statesmen, who led men into battle as well as to Heaven. The activities of such Orthodox churchmen as Rasputin and Archbishop Makarios are among the more unfortunate results.

[2] See especially the truly magnificent UNESCO publication: *Yugoslavia, Medieval Frescoes*, 1955.

Acknowledgments

I must first acknowledge my debt to those who made my two journeys to Yugoslavia possible, but whose names, because of the necessity for anonymity in this essay, cannot be mentioned here.[1] Second, I must thank the authors of the books, to which I have referred.[2] They provided me with most of the factual data in this essay, but are in no way responsible for the personal assessment which I have made here; indeed, their views often conflict with mine. Without their assistance, however, I might have missed some, at least, of the greater monuments of Serbo-Byzantine art. There are many buildings which I have not referred to here, as, for instance, the Patriarchate at Peć and Sv. Sophia at Ohrid. These, and others were omitted deliberately, because it was felt that a more exhaustive treatment would not be in keeping with an essay. I have no doubt that there remain still more, in some of the remoter and even less accessible parts, which have yet to be discovered by the enthusiast.

[1] They are the Society for Hellenic Travel and its agents, Mrs. Hardie and Miss Hindle, of Fairways & Swinford (Travel) Ltd.

[2] These books are listed in the original typescript, which is in the R.I.B.A. Library.

Natural Ventilation in Low-Latitude Buildings

A Practical Index for Design Purposes

By C. G. Webb, B.Sc., F.Inst.P., F.R.Met.S.

The ventilation index which is here described is designed for application in climates such as those of Malaya, Indonesia, New Guinea, the West and East Coasts of Africa, and the Amazon basin, with possible extensions at certain times of year, e.g. to the North Coast of Australia, to Ceylon and India, and to Central America.

In a 'doldrums' climate the ventilation process has certain features which render unacceptable the standards which have been developed in temperate climates. There appears to be a need for a fresh approach to the problem of ventilation under these conditions and a physical index of natural ventilation is proposed for use in the design of buildings for low latitudes where such climates are usual.

Low-latitude Ventilation Conditions

In the vicinity of the Equator there exists a permanent ring of low barometric pressure—the Equatorial trough—towards which the trade winds converge from both hemispheres, and at the centre of which winds are light, especially at night. The atmosphere is warm; the amount of cloud is considerable, precipitation is rather heavy, and the air is humid. There is fairly intense heat radiation from the ground and sky. Storms are of only moderate intensity, brief and local. The climate as a whole is equable, the principal variations being the daily heating by the sun and the nocturnal cooling.

The traditional Equatorial dwelling is a relatively flimsy structure of very open design (Fig. 1). In spite of the fact that buildings are unheated, the ambient temperature tends to be higher indoors,[4,6] owing to the penetration of solar radiation, and to the metabolic heat of the occupants. Other heating and cooling effects, of a variable character, may need to be taken into account.

The comfort zone for the acclimatised population, stated in terms of effective temperature, i.e. taking into account the rate of air movement and the humidity as well as the actual air temperature, lies at 75–80° F.[1,2,4,5] The upper limit of this zone is commonly exceeded indoors by day, and houses are opened to the air as much as possible without admitting too much radiation (Fig. 2). When the temperature falls at night comfort is achieved by a moderate restriction of natural ventilation, so that the bodily warmth of the occupants escapes less freely and the temperature of the indoor air rises.

Thus the indoor climate, although related to that outdoors, is to some extent an artificial one, which in its simplest form is maintained by excluding radiation almost entirely (Fig. 3), and controlling the air temperature by adjusting the rate of ventilation.

Principles of Low-latitude Ventilation

Based on the above conditions, certain principles of low-latitude natural ventilation may be stated.

1. The air temperature tends to rise in occupied buildings, and as the ambient temperature is above the comfort zone by day it is necessary to limit the rise to a small, and if possible to a negligible, value. At night the ambient temperature is lower, and a rise of about 5° F is often found desirable for comfort.

2. The amount of fresh air required to keep an occupied house cool is often very large, and more than sufficient to keep

Fig. 1. A Malay house, Malacca

Fig. 2. A school at Kuala Lumpur

ordinary odours and even cigarette smoke at an unobjectionable level. In the absence of any special source of air contamination the indoor air temperature is therefore the operative criterion of the adequacy of low-latitude ventilation.

3. Wild heat, i.e. heat from cooking fires, heat transmitted through the roof and walls or released from storage in them, insolation through doors and windows, etc., increases the requirement of fresh air. Storage of heat in the structure can at times reduce it. Through the operation of the daily temperature cycle, ventilation problems tend to be less serious in the mornings and more serious in the evenings.

4. Owing to the lightness of the wind in the evening and at night, the natural ventilation of occupied buildings is then carried on almost entirely by the stack effect; that is to say, the driving force drawing fresh air into the building is the excess buoyancy of the warmed and vitiated air already inside.

5. In crowded buildings the main source of heat is the metabolism of the occupants.

Low-latitude Ventilation Index

In the light of the above statement it is appropriate to design the openings of a low-latitude building on the basis of stack effect ventilation driven by metabolic heat, with a correction for non-metabolic heat whenever the effect is appreciable. To facilitate the process of design, and to estimate the efficacy of the natural ventilation in any actual or proposed building, the use of a ventilation index based on the calculated temperature rise of the indoor air is suggested.

It can be shown that the air temperature rise ΔT is given in degrees Fahrenheit by the equation

$$(\Delta T)^3 = 0{\cdot}045\ (400p + X)^2/A^2h$$

where p is the number of persons present, assumed to be at rest and producing heat at the rate of 400 B.t.u./hour each;

X is the aggregate rate of production, in B.t.u./hour, of all other heat in the room under consideration;

A is the total area of the openings to the outside in square feet;

h is the height of the ceiling, or the top of the highest opening whichever is the less, in feet.

The temperature rise itself could be used as an index of the effectiveness of ventilation, but it is believed that the following ventilation index E will be found more

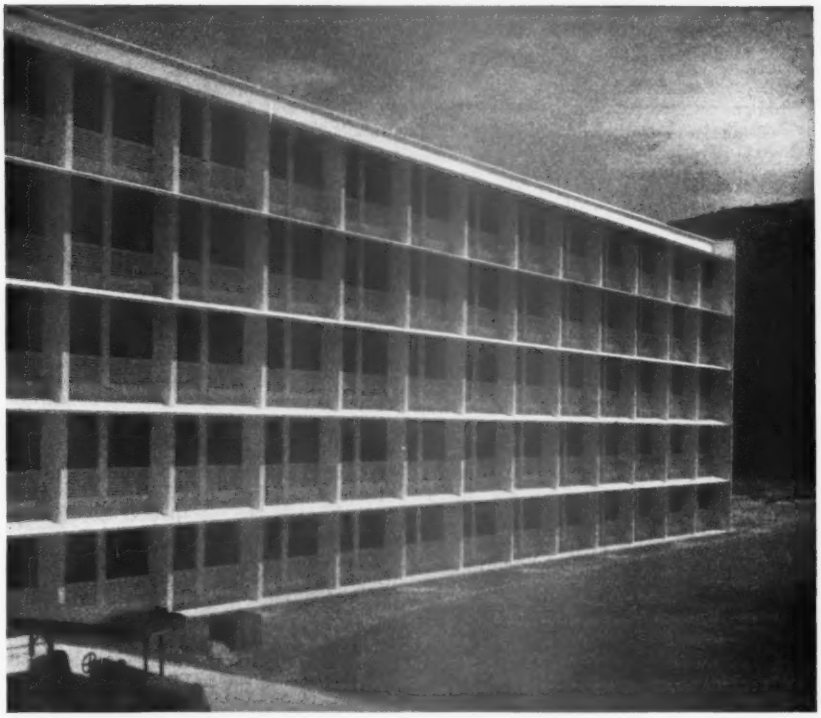

Fig. 3. A nurses' hostel in Penang

convenient. The value of E is defined and related to that of ΔT by the equation

$$E = 7{\cdot}72 - 6 \log \Delta T$$

where the numerical term has been chosen for arithmetical convenience, and the coefficient of log ΔT is designed to provide a suitably open ventilation scale.

The value of the ventilation index thus defined usually lies between 0 and 10—a convenient range—the higher values denoting the smaller temperature rises and better ventilation. Ventilation is adequate if $E = 4$ or 5 and ceiling fans are installed, or the room is used only at night. $E = 10$ denotes an indoor climate indistinguishable from the outdoor shade climate in a sheltered place, and would be considered somewhat on the cool side. $E = 2$, on the other hand, is uncomfortable and $E = 0$ is dangerous. The value of E that is selected for design purposes will depend on circumstances and on the standard of ventilation which is required.

The relationship between the index E and the temperature rise is given in the table below, together with data on the rate of supply of fresh air through the operation of the stack effect, in the absence of any appreciable amount of wild heat.

The magnitude of the fresh air supply for

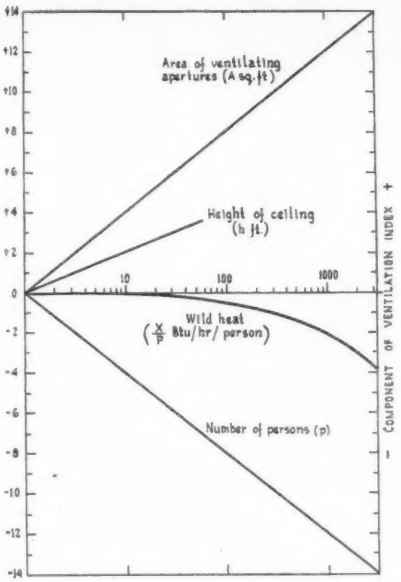

FIG. 4. GRAPHICAL DETERMINATION OF VENTILATION INDEX E
(The four quantities A, h, p and $\frac{X}{p}$ are measured on the common horizontal logarithmic scale.)

Ventilation index E	Rise of temperature ΔT, in °F	Fresh air supply cu.ft./hr./person ($X = 0$)	Comment
10	0·4	54,000	Excellent, cool
9	0·6	37,000	
8	0·9	25,000	Very good
7	1·3	17,000	
6	1·9	12,000	Good
5	2·8	8,000	
4	4·2	5,500	Adequate
3	6·1	3,700	
2	8·9	2,500	Uncomfortable
1	13·2	1,700	
0	19·3	1,200	Dangerous

the higher values of E will be noticed. It is clear that the rates of air change also, which—since they depend on the space available per person—do not appear in the table although they may be calculated readily in a given case, are of a higher order of magnitude than those prevailing in temperate climates.

Provisos

There has been an implicit assumption that the ventilation openings are favourably disposed for stack ventilation, that is to say, that about half the available area of openings is close to ceiling level, and the remainder is close to the floor. Any major departure from this disposition involves a reduction in the effective area of the openings or in the effective ceiling height, or in both.

Small positive amounts of wild heat, say $X/p = 100$ B.t.u. per person per hour or so, affect the ventilation index only slightly and can usually be ignored. Similar negative amounts, whether arising from refrigeration, from evaporation of moisture from the walls, or from heat storage in the structure of the building, greatly affect and improve the ventilation conditions. Apart from refrigeration, with which this note does not pretend to deal, the processes which may give rise to negative wild heat tend to operate in this direction in the mornings only. The present consideration of the matter is confined to cases where the wild heat is fairly small in amount and is positive; and the index applies to open, not air-conditioned, accommodation in the afternoons, evenings, and at night, under ordinary, not very severely overcrowded, conditions of continuous occupation.

Large amounts of wild heat may occur in badly designed kitchens or in factories, but it is believed that X/p will rarely exceed 1 kilowatt per person. Some care will be needed for the assessment of X/p in certain cases, but fortunately it can usually be neglected in the common case of the crowded auditorium in use for a night performance.

Graphical Method of Determining the Ventilation Index E

Introducing the value of ΔT from the first equation, the ventilation index may be calculated using either of the equations:

$$E = 4 \log \frac{A\sqrt{h/p}}{1 + X/400p}$$

$$= 4 \log A + 2 \log h - 4 \log p - 4 \log (1 + X/400p)$$

To facilitate the evaluation of E, each of the four terms on the right hand side of the last equation has been plotted in Fig. 4. Knowing the values of A, h, p and X/p the separate components of E can be determined from the four graphs, and the total value found by summation having regard to the positive and negative signs.

Example

As an example, consider a room with a 10 ft. ceiling and with openings whose total area is 250 sq. ft., when 50 persons are present in the room. Suppose it is evening and there is a small amount of positive wild heat, the effect of which on the ventilation index can be neglected. From Fig. 4 the components of E corresponding to A, h, p and X/p turn out to be $+9{\cdot}5$, $+2$, $-6{\cdot}8$ and zero respectively, and the final value is therefore

$$E = +9{\cdot}5 + 2 - 6{\cdot}8 + 0 = 4{\cdot}7$$

By comparison with the table we can see that the ventilation in this case will in the absence of wind, be no more than adequate. The indoor air will be 3° F warmer than that outside and by day the use of fans would be necessary. By night the ventilation would be ample without fans. The supply of fresh air through the operation of the stack effect is more than ten times that specified in European codes of practice, and the possibility of odours, etc., becoming objectionable need not be considered in ordinary circumstances.

Acknowledgment

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Structural Fire Problems in Shed-Type Buildings Used for Light Engineering

By Eric L. Bird, M.B.E., M.C. [*A*]

DURING THE LAST YEAR or two industrialists have shown a great and increasing interest in the potential behaviour in a fire of the shed-type class of building in which the bulk of British industrial production is housed. While those trades which are inherently fire-hazardous have always paid considerable attention to fire problems, there has been until recently a notable lack of interest in them among the less hazardous industries such as the many varieties of light engineering.

This is not to say that industry generally has been backward in the provision of fire-fighting equipment, the placing of 'No Smoking' notices where required, and even in the training of personnel. But the interest has been uneven. Many large firms operate excellently organised fire departments with highly trained works brigades; others do no more than the minimum required of them under the Factory Acts.

What has most shaken the light engineering industries is the recent realisation that the structures of their buildings can play an important part in the overall fire hazard, in that light unprotected metal frameworks can collapse quickly and disastrously and that combustible roof deckings can spread fire at frightening speed. This is a problem, or series of problems, which is of direct concern to architects.

The first shock came with the fire at a General Motors plant at Livonia in Michigan in 1953 where a steel-framed and steel-decked building covering 34½ acres collapsed with dramatic speed from a fire originating in a dip tank. The building, incidentally, had been classified for insurance purposes as 'having non-combustible construction and generally non-combustible contents'. This incident was reported in the JOURNAL of February, 1954.

The problem was brought much nearer home by the fire in the factory of the Jaguar Car Company at Coventry last February. Here a steel-framed shed building decked with a Class 4 (Rapid Flame Spread) fibreboard and R.P.M., suffered from spread of fire and severe distortion of steelwork. About the same time serious fires also occurred in the works of Nash Kelvinator Ltd. and the Goodyear Tyre Co.

The purpose of this article is not to attempt any sort of analysis of these fire incidents, but rather to examine the problems which architects, the Joint Fire Research Organisation, the manufacturers of roof cladding materials and systems and other firms and interests connected with industrial structures have to solve. Most people concerned with factory building are, of course, already well aware that these problems exist and are taking steps to solve them.

One recent attempt by manufacturers to study a group of problems was the experimental fire at Uxbridge arranged by Cape Building Products Ltd., in conjunction with Colt Ventilation Ltd., which was reported in the Review of Construction and Materials in the July 1957 JOURNAL.

The problems of industrial roofing have recently been made more complex by the passing into law of the Thermal Insulation (Industrial Buildings) Bill which requires that in future new industrial buildings—with some exceptions—shall have insulated roofs.

The Economics of the Shed-Type Building

It is desirable first to look briefly into the underlying economics of the shed-type structure. What matters to the manufacturer is his production process and the need to keep it producing. For this he requires a cover to protect the plant and operatives from the weather—a cover from which he can suspend light fittings and occasionally items of plant such as piping and overhead conveyors. The capital locked up in the building is unproductive, unlike that spent on a machine which provides a measurable return. Therefore manufacturers tend to seek inexpensive structures, especially nowadays when the taxation system favours expenditure on maintenance rather than on initial cost. However, it should be borne in mind that for the manufacturer the building is something of a necessary evil. If his plant was such that it did not need a cover, he would dispense with one.

Quite commonly the capital cost of the building is no more than one-fourth that of the plant and in some instances the ratio may be as great as one to twenty, especially in the case of storage buildings. But it is keeping the plant *working* that matters to the manufacturer. If he has to close down for some months because of a fire, he may, on getting his plant ready to work again, find both his markets and his skilled operatives in the hands of his competitors. Some firms have even found recovery after a severe fire to be impossible and have had to close down. At best it is a 'long haul' back to the stage of prosperity before the fire.

Therefore the realisation that a fire in a shed-type factory structure might put the owners of a light engineering process—not in itself especially fire-hazardous—out of business, came as an unpleasant surprise to many industrialists.

The Fire Behaviour of Light Steel Frameworks

The shed-type building which is commonly used for a light engineering occupancy, usually consists of an unprotected steel framework, clad with some form of sheeting or built-up decking. The fire load of the occupancy is low and, in spite of oil on machines, the risk of rapid fire spread in it is not great. But there are usually some items of plant from which fires can originate either because they are heat-generating or because they make use of flammable substances.

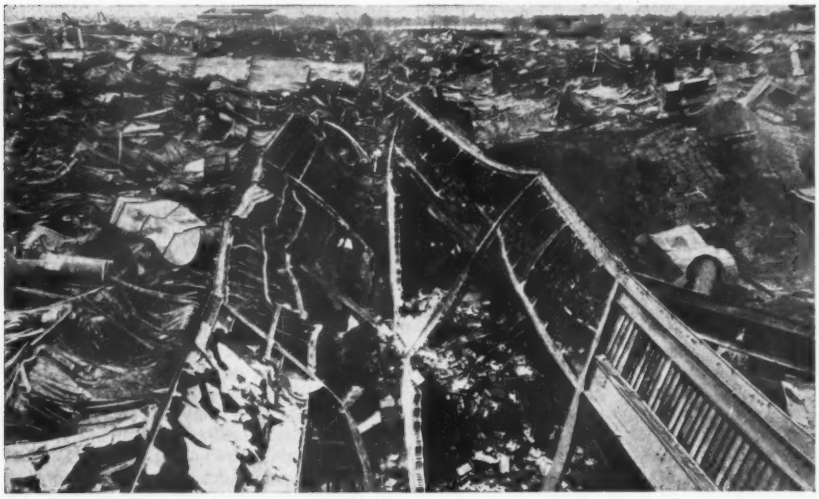
Usually the buildings are planned as large voids. Subdivisions, where they occur, are frequently made with flimsy and even combustible partitions. This planning, which may be necessary for production reasons but is often merely a bad habit, permits a fire which is out of control to sweep through the interior. If there is inadequate ventilation the whole interior may become filled with smoke so that the seat of the fire is hard to locate. It is noteworthy that, in the Jaguar fire, the explosion of an oxygen tank blew off part of the roof sheeting, thus letting out the smoke and enabling firemen to attack the fire.

In most light engineering occupancies, an outbreak of fire is likely to remain circumscribed for some time (provided the roof does not spread it by itself burning), a column of hot gases and smoke rising to the roof. While the build-up of temperature beneath the roof may be delayed by the action of ventilators in allowing heat to escape (see below), the exposed metal framework may quickly attain a temperature at which structural failure occurs. In the case of mild steel this temperature is 450°C. There have been numerous cases of metal frameworks starting to collapse from 15 to 30 minutes after an outbreak of fire. Under B.S. 476 test an unprotected 8 in. by 6 in. mild steel column failed in 11 minutes.

It is this factor of early collapse which appears mostly to influence the extent of damage. Firemen cannot be expected to remain hosing a fire at close range while the roof is collapsing over their heads. Naturally they retreat from the vicinity of the fire, leaving it to grow unchecked and to involve stanchions, beams and trusses in a general spreading collapse. Eventually they are driven outside the building. The throw of a fire hose is about 100 ft. Very many industrial buildings have plan dimensions far greater than 200 ft. so that the central portion of the fire soon becomes outside hose range.

This form of spreading collapse occurred at the Livonia fire and was almost certainly

The Livonia Fire. Firemen driven outside the collapsed building



The Livonia Fire. Part of the 34½ acres of ruin

the factor most responsible for the complete ruin of the building and plant, though other factors contributed. Had the framework not collapsed, the relatively small fire in the dip tank could have been 'surrounded' (to use a fireman's term) and extinguished with no more than localised damage. As it turned out, however, the firemen were reduced to squirting water vainly a mere 100 ft. into a 34½ acre jumbled ruin in almost all of which fire could spread unchecked.

This characteristic of the light steel frame has been often overlooked by architects in the past. But its realisation now is no reason for abandoning the use of unprotected structural steel shed-type buildings. Steel framework is economical in both cost and erection time, permits the construction of exceptionally long spans with few supports and has, if necessary, considerable scrap value. Plant engineers like it because, with the use of clips, alterations can be made easily and quickly to pipe runs, overhead conveyor runs and lighting, much more so than with a reinforced concrete framework. Change is a feature of much light engineering production as new machines are acquired and new models produced. We may therefore expect industrialists to go on demanding steel framed buildings. There remains the problem of preventing a fire causing spreading collapse.

At present there appear to be two ways of doing this, either separately or in combination. The first is to provide the building with automatically opening ventilators, operated by fusible link, which allow excess heat to escape so that the period of time before the steelwork reaches the critical collapse temperature is extended. The second is to protect the steelwork with some form of insulation.

Venting of Fires

On the question of venting fires there are two main schools of thought. The first argues that if a fire is vented through the roof, air is drawn in which feeds the flames, causing the fire to be more fierce and to grow more quickly than if it were starved of oxygen. The other argues that, by allowing heat to escape, the risk of steelwork softening is reduced and smoke is cleared out, thus permitting firemen to locate and approach the fire. Most firemen are in favour of venting and indeed have been known to make holes in roofs to draw off smoke so that they could see and move in otherwise smoke-logged interiors.

There is a third school of thought which argues that, while ventilators should be provided, they should be manually controlled and not automatic so that the fire may be kept confined and small until the fire brigade arrives. This idea is perhaps less applicable in factories which have large interior voids and consequently an ample air supply and in which there may be works fire brigades, than in some other types of building.

In buildings used for light engineering where the risk of fire spread in the contents near floor level is not great, there seems much to be said for venting in principle. On the other hand in some circumstances it might be dangerous. For example, a combustible roof of, say, boarding and felt might be the more readily ignited by a blast of flame induced through a ventilator. Therefore it appears that venting should be considered in relation both to the occupancy and the structure.

For the fire trial organised by Cape Building Products Ltd., referred to above, a shed building 30 ft. by 20 ft. on plan and 20 ft. 6 in. high to the ridge was erected. It was lined with asbestos insulating board, backed with rock wool building mat, the trusses being encased in the same material. In each of the three bays there was a Colt heat and smoke exhaust, operated by fusible link, placed close to the ridge. One of the bays was cut off by an asbestos curtain, also operated by fusible link. This curtain, which operated successfully, is likely to be of use more in buildings which have clear gangways such as stores, than in those housing engineering plants which may have high-level conveyors.

In the other two bays combustible material equivalent to a fire load of 100,000 B.T.U.s per sq. ft. was placed and ignited. The two ventilators over the fire compartment opened almost at once and that in the third compartment soon after. Smoke cleared quickly from the interior. The fire was allowed to burn for half an hour, at the end of which time the steel framework was intact and the asbestos board lining only slightly damaged. How much the survival of the steelwork resulted from the ventilation and how much from the lining could not be determined but, without these two protections, the steelwork would certainly have collapsed within the half-hour of the fire's duration.

Increasing the Fire-Resistance of Light Steelwork

Until recently the principal method of increasing the fire-resistance of structural steelwork has been to encase it with 2 in. of reinforced concrete. This method, which gives 2 hours' fire-resistance, serves very well for the multi-storey building but is quite impracticable with light steel trusses. Moreover, in shed-buildings which house light engineering there is no need for anything like 2 hours' fire-resistance. Probably a maximum of 1 hour suffices, giving time enough for a fire to be extinguished without fear of collapse. This can be attained with the use of certain non-combustible or fire-retarding sheet materials, provided care is taken in detailing, or by coating the steelwork with vermiculite or asbestos sprays. In another recent fire trial, organised by Pyrok Ltd., a small steel-framed shed, sheeted with a variety of materials, the whole framing and cladding being protected with a sprayed vermiculite coating, survived intact.

These various methods and materials for protecting roof steelwork clearly have differing properties and costs which cannot be discussed here. If the trusses are enclosed with non-combustible or fire-retarding sheet materials—sometimes termed 'forming curtain boards'—the roof assumes the shape of a series of inverted pockets. The curtain boards check the lateral spread of hot gases and smoke and, if there is an automatic vent at the apex of each pocket, will help to canalise the gases and smoke out of the building.

Curtain boards are awkward to provide, if not impracticable, where there are conveyors and pipe runs above the bottom chord of trusses or where the steelwork consists of complex space-frames. Moreover, in many occupancies of low fire load, protection of roof steelwork may be unnecessary, reliance being placed solely on automatic vents.

There remains the question of protecting stanchions. The stanchion is a highly critical member in the progress of spreading collapse. Commonly it starts with the buckling of a single stanchion, subjecting adjoining stanchions, through the valley beams, to extreme bending stresses. This is especially liable to occur where a stanchion is surrounded with combustible material—e.g. boxes and cartons stacked against it. Therefore it seems a wise precaution always to protect the stanchions, which is achieved quite inexpensively by a variety of methods, even if the valley beams and trusses are left unprotected.

The Jaguar Fire. Collapsed steel framework

The Jaguar Fire. Brickwork gable walls pulled over by collapse of steelwork

Behaviour of Claddings

The behaviour of roof deckings and claddings should next be considered. Some of the worst industrial fires have occurred in shed-type buildings which had boarded roofs or underlinings of insulating materials with a Class 4 spread of flame rating. The fire has ignited the boarding or underlining and, although it has not spread much in the plant or contents on the factory floor, it has done so with great rapidity overhead. Apart from the fact that the firemen have had to deal with two simultaneous fires—one on the floor and one overhead—it has frequently happened that burning pieces have fallen from the roof and started new fires behind the backs of the firemen. Moreover, the presence of a considerable fire at roof level has accelerated the collapse of steel trusses.

In general it does not matter much to the industrialist that the roof cladding immediately over a fire suffers damage. Replacement of a few sheets is simple and inexpensive, possibly much less so than is the replacement of the item of plant in which the fire started. What should be avoided at all cost is damage by a burning roof to other items of plant which are out of immediate contact with the fire on the floor, involving the risk of the whole plant being put out of operation.

At the moment very little is known about the comparative performances of the various forms of roof cladding used on shed-type buildings in respect of first cost, insulation value, fire-resistance, maintenance and resistance to corrosion—all factors of importance. There are many unsupported claims by manufacturers and some denigration of rival materials and methods which are stated to burn, shatter or melt according to individual points of view. The arguments used in discussion are mainly drawn from reports of firemen. Generalising from individual cases is always unwise. The real value of such reports is as corroboration of information derived from properly conducted, observed and recorded tests.

Corrosion

The problem of corrosion is a material one in design and selection of shed-type roofings and it has some relation to the fire problem. Many factory buildings are subjected externally to corrosive industrial or marine atmospheres or internally to corrosion arising from acid-laden vapours in conjunction with condensation produced by the processes in the buildings.

A comment on fire-resistance and non-combustibility. Timber posts which survived the steel trusses which they were supporting

What can happen when a reinforced concrete floor is supported on unprotected steelwork

So far, the only practicable methods of protecting ferrous metals against corrosion is by hot-dip galvanising or by the use of bitumen either in coatings on sheet metal or in the form of paint on steel members. In some corrosive conditions both galvanising and bitumen coating must be used if the metal is to have reasonable life.

Moreover, the tendency to use flat roofs (with or without monitors) over industrial buildings is on the increase. On these roofs the necessary built-up decking is almost invariably surfaced with bituminous felt for weather resistance.

The Behaviour of Bitumen

Bitumen softens and can be ignited at a temperature of 300°C., though fire does not spread in it unless and until this temperature is continuously maintained. The presence of an insulating underlining (provided it is fire-resisting) will slow up the temperature rise in the bitumen. Further, it appears to be desirable so to design a roof deck, whether pitched or flat, that burning bitumen cannot drip into the building. However, should dripping occur, the addition it can make to a low fire load (100,000 B.T.U.s per sq. ft.) is unlikely to be more than 2 or 3 per cent with normal construction. The burning and running of bitumen on the outside of a roof, though spectacular, is usually of little consequence and is easily checked by hosing.

Fire Resistance versus Non-combustibility

The essential differences between these two properties are not generally understood. Good fire-resistance is not necessarily obtained by the sole use of non-combustible materials; sometimes the reverse may be the case.

The principal objectives in the design of a shed-type building in respect of fire resistance are to provide:—

(1) A framework with a good collapse time.
(2) A roof cladding which does not spread fire laterally.

The following two designs of shed-type building, identical except in structural framework and cladding, may be considered.

Design A has a framework of timber which is treated with a fire-retardant (either an intumescent type of paint or an impregnation with a solution). The cladding consists of a bitumen-protected sheeting (R.P.M.) with an underlining of an asbestos-paper-faced insulating fibreboard so fixed that it cannot readily fall out under the effects of fire.

Design B has a framework of mild steel. The cladding consists of a corrugated asbestos-cement sheeting with an underlining of flat asbestos cement sheeting and a sandwich of glass fibre quilt as insulation.

In Design A probably 90 per cent of the total cube of material is combustible: in Design B, all the material is non-combustible.

If equivalent fires are started in the contents of both buildings it seems clear that the behaviour of Design A in respect of the requirements stated above is likely to be somewhat superior to that of Design B. Both will be damaged by the fire, but the protected timber frame will probably remain standing longer than the steel frame while the cladding in Design A is likely to survive more or less intact longer than that in Design B which will be prone to collapse and fall away though, in some circumstances, this may not be a defect, in that it may serve to vent the fire. In neither cladding, of course, will there be surface spread of flame. These are two extreme theoretical cases which are put forward only to indicate that designing to take advantage of the properties of materials is likely to be more a profitable approach than the pursuit of non-combustibility.

The Need for Research

The foregoing discussion is mainly a series of assumptions—a statement of probabilities based on some experience of the fire-behaviour of structures and combinations of materials. Assumptions of this kind have to be made because there are no accurate research data which allow of more precise assessments.

Research is needed on four principal matters:

(1) The fire-behaviour of common types of light cladding, not merely single materials, but combinations of materials intended to give weather exclusion, thermal insulation and resistance to corrosion.
(2) The collapse times of various structural frameworks.
(3) The effects of venting of fires both in restricting their lateral spread and in lengthening the pre-collapse times of steel frameworks, with determination of the optimum area and distribution of vents in relation to floor area in various occupancies.
(4) The effects of interior height and of shape of section (e.g. flat with monitors as against north-light) on collapse and fire spread.

Research of this kind should properly be conducted by an independent research body; in Great Britain the appropriate body is the Joint Fire Research Organisation possibly in collaboration with the Building Research Station. Research so conducted will provide more accurate data and be more authoritative than empirical trials conducted by commercial interests, though the latter are not without value.

It may be argued that to be accurate, such research must for the most part be carried out at full scale and therefore involve very heavy expenditure. This is probably true; but any expenditure on such research should be viewed against the hundreds of millions of pounds invested annually by British industry in shed-type buildings. This is an enormous field of building and one of vital importance to a nation which lives by exporting manufactured goods. Such research would remove the design of shed-type buildings from the realm of speculation and opinion and the competing claims of rival manufacturers.

The existing B.S. 476 fire tests, being intended mainly for substantial multi-storey structures, do not adequately cover the subject of the fire-behaviour of the shed-type building. Further, the basic criteria of these two building types are different. The Spread of Flame Test, being confined to single materials, is also an insufficient guide to the fire-behaviour of built-up claddings. Whether a new series of B.S. tests could be devised is a matter for the appropriate technical committees with their scientist advisers and cannot be discussed here.

Other Occupancies and Structures

The above discussion has been confined mainly to shed-type buildings housing light engineering processes. Although an important field of industry, it is but one of many for which shed-type buildings are used. In some the fire risk is negligible as in heavy engineering or is even absent as with the manufacture of cast concrete products. In others, notably chemical engineering, textile and clothing manufacture and some kinds of food processing, the fire risk may be high. Many of these latter categories of occupancy require the primary protection of sprinkler systems though, in addition, they call for consideration of the fire-behaviour of the structure.

Some processes have to be housed in multi-storey buildings which, though they present a series of fire problems rather different from those of the shed-type building, are affected by the same physical laws in that unprotected structural steelwork softens at 450°C and Class 4 lining materials have 'Rapid Flame Spread'. There have been several cases of collapse in industrial buildings of reinforced concrete floors which have been supported on unprotected steelwork.

Conclusion

Generally there appears to be a great need for a study of structural design in relation to the differing fire hazards of industrial occupancies. At present the annual bill for direct fire damage in industrial and commercial premises amounts to about £12,500,000. This figure is exclusive of the unmeasurable but undoubtedly far greater consequential losses in production, trade and employment.

If this waste is to be reduced, and if industrialists are to be reassured about the safety of their buildings, a concerted study by architects, scientists, engineers and the manufacturers of structural and cladding materials seems to be required. But in this study the contribution which can be made by scientists is of first importance. Today, the techniques of design in such matters as acoustics, lighting, heating, insulation and structural stability are based on substantial amounts of precise research data; guesswork is a thing of the past. This is not the case with structural fire-resistance, except for the multi-storey building of fixed occupancy.

[*The first four illustrations have been lent by the Fire Protection Association.*]

Preservation of Architectural Records

THE FOLLOWING MEMORANDUM has been received from the Hon. Secretary of the Vernacular Architecture Group:

In view of the rapid disappearance of examples of the smaller domestic architecture in all parts of the country, this Group considers it desirable to try to preserve existing graphic records (plans, elevations, sketches, sections and photographs), and to make copies available for study.

The records of many practising architects include such plans, etc., of farmhouses, cottages, farm buildings, old houses before conversion and the like. Such records are presumably destroyed in periodical clearances or drives for waste paper.

All architects whose practice includes, or has in the past included, work on old buildings of any type are invited to communicate with the Vernacular Architecture Group, stating if possible the scope of the material (i.e. the approximate number and types of different buildings for which records exist), and whether they would be prepared to take either of the following courses:—

1. Deposit the drawings and other relevant records with the National Buildings Record either as a gift or upon indefinite loan.
2. Lend the documents for recording and, in suitable cases, for photo-copying. The National Buildings Record will pay a fee of one guinea for each measured drawing accepted on loan for copying at its expense. In the case of a set of sheets relating to one building, one guinea will be paid for the first sheet and 10*s.* 6*d.* each for the others. No size is stipulated, but it is expected that sheets will contain a reasonable amount of information. Copyright remains with the author; if a drawing is required for publication or for professional purposes, the N.B.R. will stipulate that the author must be approached and his consent obtained. Consideration will be given to drawings done at any time in the past.

It is pointed out that many drawings which would ultimately be destroyed owing to pressure on storage space are of great historical interest. A selection of them would add further value to the large and important collection already in the National Buildings Record.

Any architect interested is invited to communicate with the Director, National Buildings Record, 31 Chester Terrace, Regent's Park, London, N.W.1, or with the Hon. Secretary of the Vernacular Architecture Group: T. W. French, M.A., 8 Water End, Clifton, York.

I.U.A. Notes

A MEETING OF the Ordinary Assembly of the International Union of Architects was held in Paris from 5 to 7 September. The United Kingdom delegation consisted of Professor R. H. Matthew [*F*], Professor R. J. Gardner-Medwin [*F*], Mr. Arthur Ling [*F*] and the Hon. Godfrey Samuel [*F*]. The meeting, which was largely concerned with the routine business of the Union, approved the decisions of the Executive Committee of the Union regarding the forthcoming I.U.A. Congress at Moscow. This will now be held in July 1958.

Señor Mardones Restat (Chile) was elected President of the I.U.A.

The Chairman of the United Kingdom Committee, Professor R. H. Matthew, was elected a Vice-President of the Union. The United Kingdom Committee is the liaison committee appointed by the R.I.B.A. Council to represent the Profession in the United Kingdom.

Meetings of the Executive Committee took place in Berlin from 19 to 21 August and at Ville d'Avray on 7 September. At their first meeting the Committee resolved to found an 'August Perret Prize for Architecture' and a 'Sir Patrick Abercrombie Prize for Town Planning'.

Working Commissions. Meetings of the Commission de l'Habitat (Housing Commission) and the Commission de la Recherche dans l'Industrie du Bâtiment (Research in the Industrialisation of Building) took place in August. Mr. Peter Shepheard [*A*] and Mr. Gontran Goulden [*A*], who are respectively the United Kingdom representatives on the two commissions, attended the meetings. The Commission de l'Architecte met in Paris in September. It was attended by Professor R. H. Matthew on behalf of the United Kingdom in the absence of the official U.K. delegate, Professor R. J. Gardner-Medwin. The Commission de l'Urbanisme (Town Planning) met in Prague in October. Mr. Arthur Ling, the United Kingdom delegate, was unable to attend but sent in a report on the subject of Car Parking in the various member countries of I.U.A.

Geneva Seminar. A Seminar on Hospital Construction organised jointly by the I.U.A. Public Health Working Commission and the World Health Organisation took place in Geneva from 9 to 19 September. Mr. Donald Goldfinch [*F*], the United Kingdom representative on the Commission, took part in the organisation and direction of the Seminar. Mr. Goldfinch has been appointed Chairman of the Working Commission.

The Seminar, which was intended for architects and hospital technicians from the countries of the Middle East and North Africa, proved such a success that the Working Commission are hoping to organise seminars on hospital construction in the future for representatives from other parts of the world.

Cantilevered structure above the main entrance which houses the board room suite

Renold House
Wythenshawe, Manchester

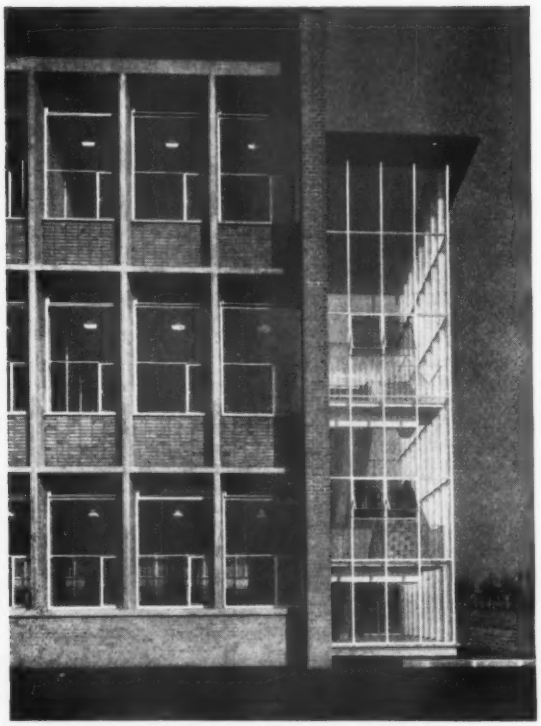
Architects: Cruickshank and Seward
(H. T. Seward [*F*])

THIS BUILDING was awarded the R.I.B.A. Architecture Bronze Medal in the area of the Manchester Society of Architects for the five-year period ending 31 December 1955.

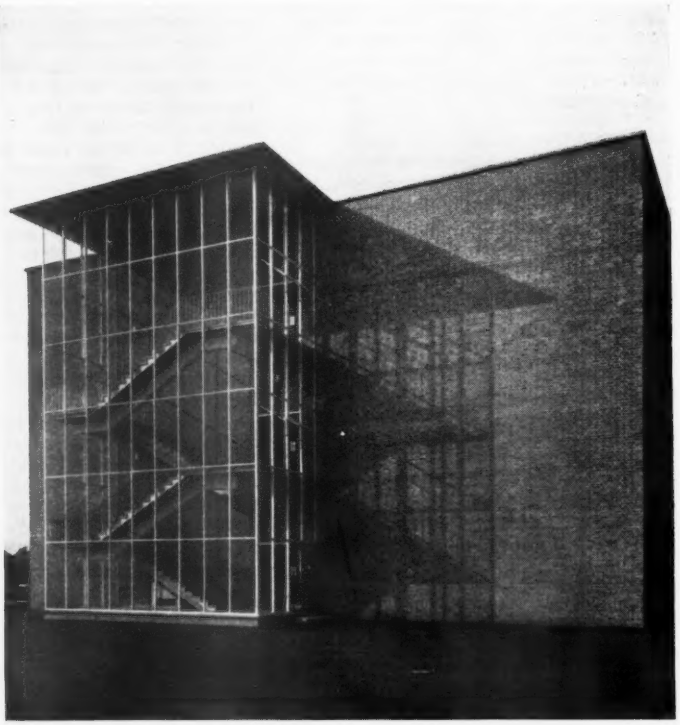
It houses the Head Office and Central Selling and Administrative organisation of Renold Chains and is situated at Wythenshawe, nine miles south-west of Manchester.

All rooms overlook lawns, and those facing east have a fine view of the Pennines, eight miles away. The building is the terminal feature of Ringway Road at the junction of Styal and Ringway roads and is planned symmetrically about its axis in the shape of an H, the two parallel wings containing general and private offices, and the centre wing largely made up of filing and record rooms, stores, cloakrooms and lavatories. The cantilevered structure above the main entrance contains a suite of rooms for directors' meetings.

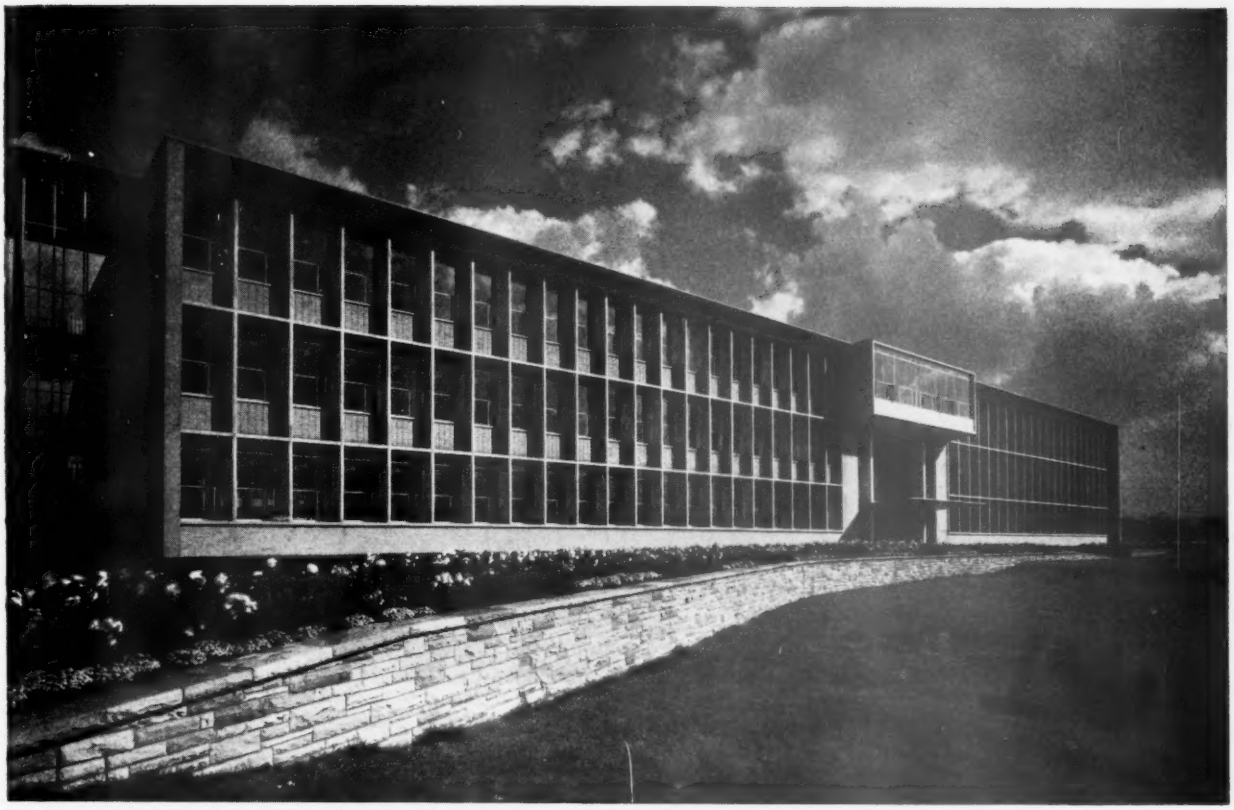
Front and centre wings are three-storeyed: the rear wing has two floors, and a third will be added later.



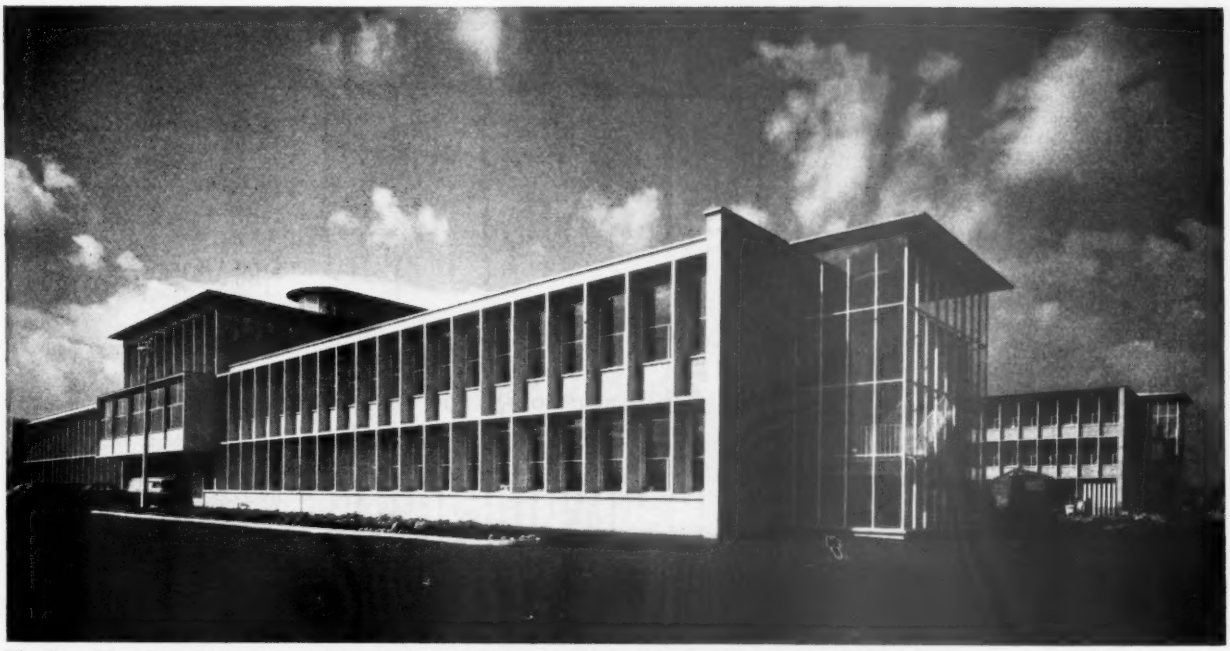
Detail of exposed structural framework in Front Wing



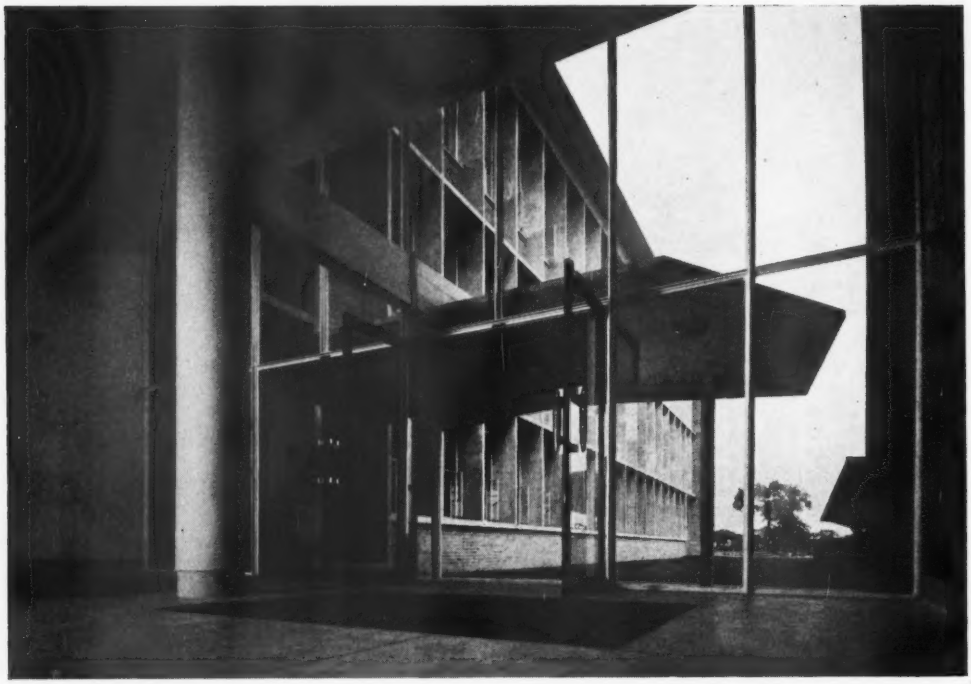
Stair tower attached to Front Wing



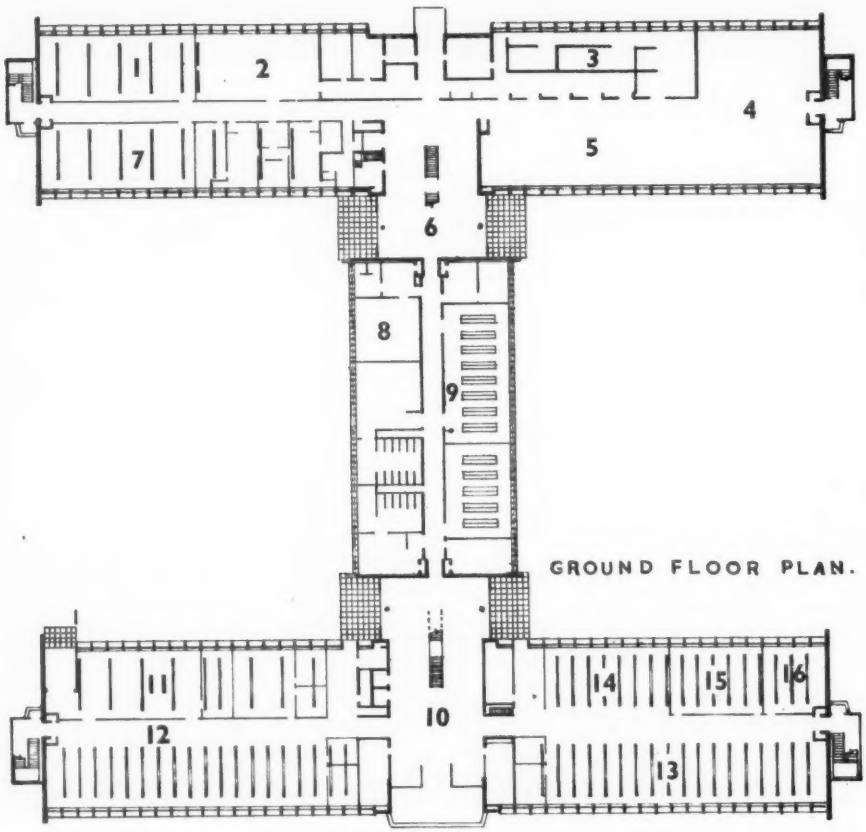
The Front Wing from the north-west, showing main entrance



The Rear Wing from the north-east. This wing is designed for the addition of a further storey at a later date



Centre Wing, view of entrance from inside the lobby. On facing page exterior of Centre Wing showing glass block wall



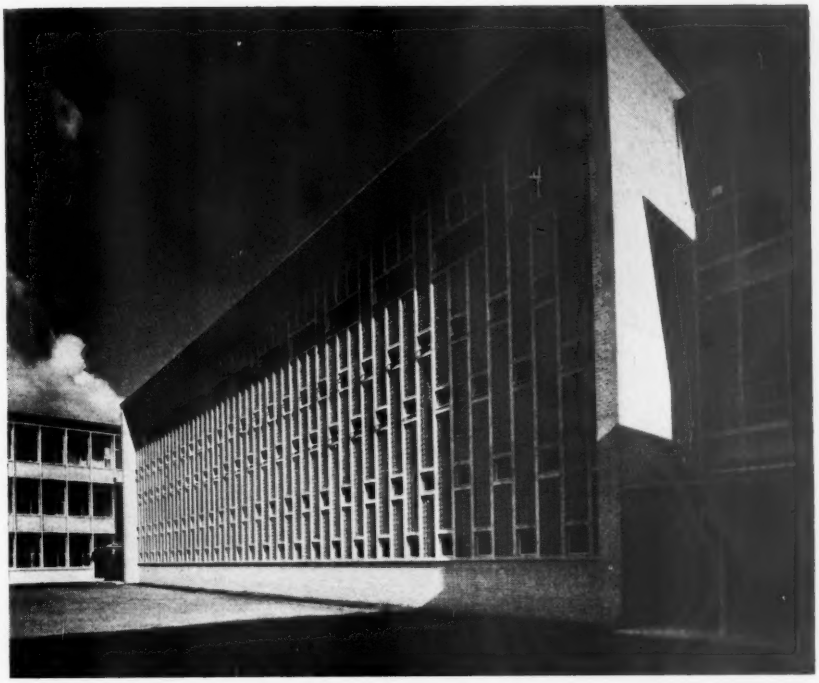
GROUND FLOOR PLAN.

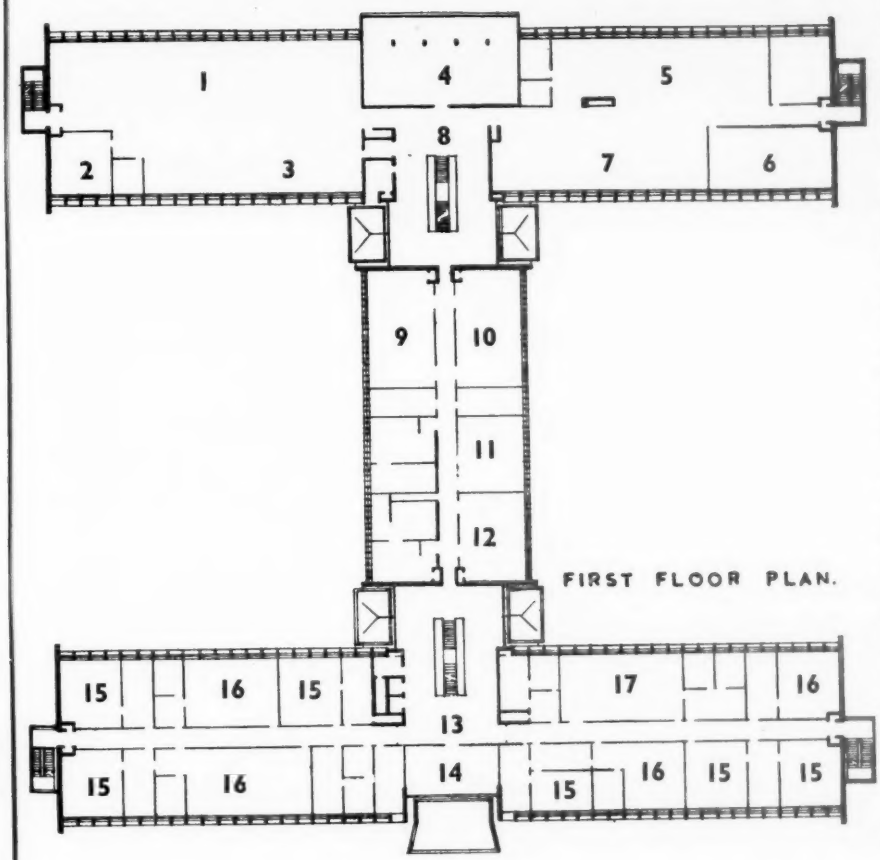
Ground Floor.

1. Printing and paper store.
2. Manager's dining-room.
3. Kitchens.
4. Social club room.
5. Dining-room.
6. Rear entrance hall.
7. Office equipment.
8. Kitchen staff.
9. Cloakrooms.
10. Entrance hall.
11. Mailing department.
12. Sales clerical services.
13. Sales home sub-function.
14. Filing room.
15. Typing room.
16. Conveyor chain sales.

First Floor.

1. Sales statistics and dispatch control.
2. Cash office.
3. Customs accounts and calculating.
4. Establishment office.
5. Technical department.
6. Typing room.
7. Export department.
8. First floor hall.
9. Tabulating department.
10. Duplicating department.
11. Filing room.
12. Stationery store.
13. Stair hall.
14. Ante-room.
15. Office.
16. Secretariat.
17. Development department.





FIRST FLOOR PLAN.

The internal layout had to be flexible, so each wing has an uninterrupted level ceiling to allow the sectional partitions to be rearranged in any desired layout. Desks are placed at 6 ft. centres; telephone and electrical services are brought to them by concealed floor channels.

The construction throughout is of in situ reinforced concrete expressed in the two parallel wings as a honeycomb of vertical and horizontal fins. The desk layout determined the structural grid, and the vertical fins are spaced at 6 ft. centres: they are 5 in. wide, which was found to be the minimum practicable dimension for efficient jointing.

The system possesses a high resistance to wind pressure and eliminates the transfer of large moments to the flooring system. The centre wing has glass block walls standing in front of the structural frame, subdivided by mullions and transoms of precast reinforced concrete, the latter, framing opening windows, being attached to the edges of the cantilevered floor slabs. At either end there are fully-glazed towers lighting the principal staircases which separate the centre wings from the front and rear wings.

Generally, external walls are built of golden brown hand-made bricks, contrasting in colour and texture with the exposed concrete members. The small recessed panels under the office windows have continuous perpends, emphasised by raking. The secondary stair towers project at either end of front and rear wings; the staircases are bracketed from the end framings of the wings and ride clear of the walls to reveal the full sweep of the brickwork through the glass.

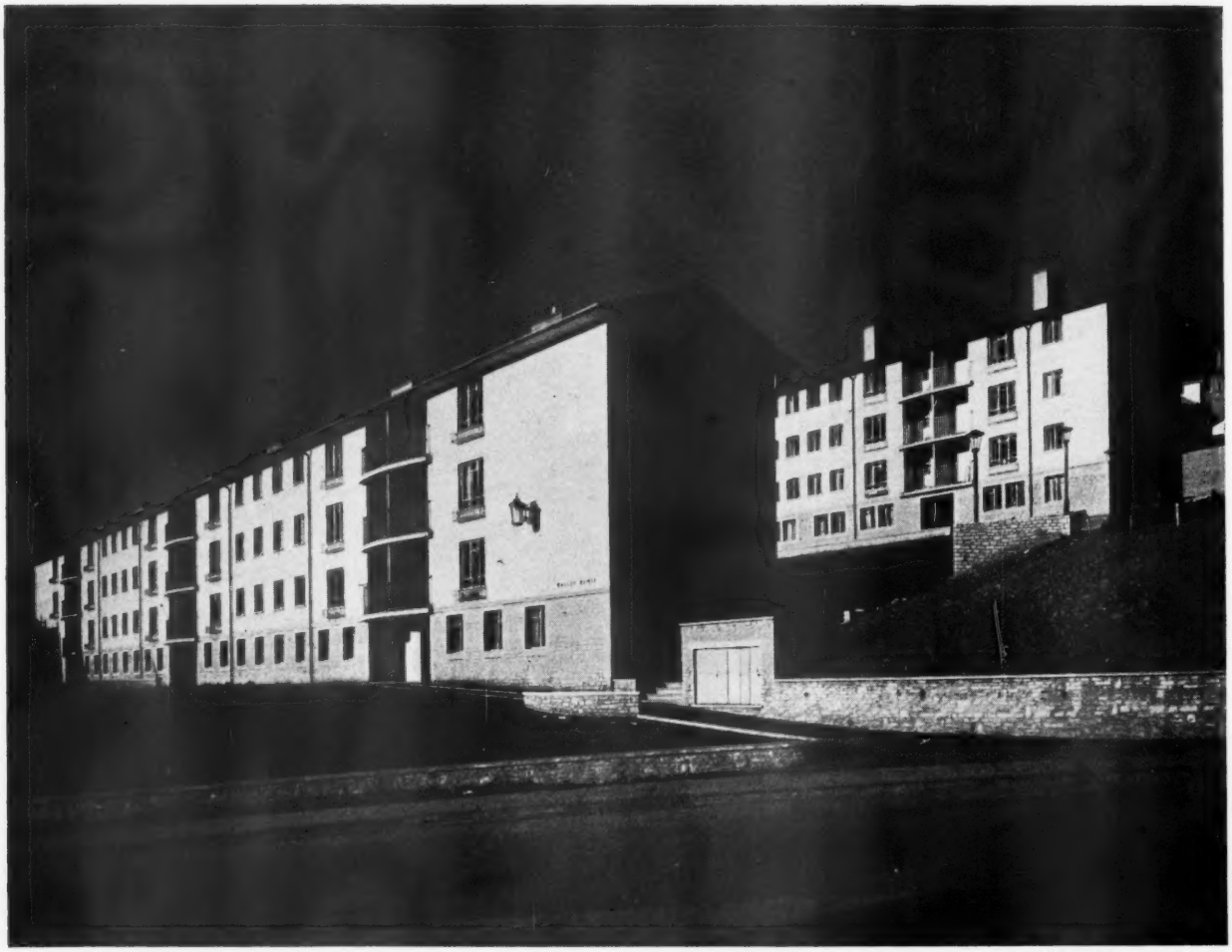
The projected structure above the main entrance, which houses the board room suite, is lined externally with cream travertine, and this is also used to face the external supporting columns and the walls and ceiling of the main entrance vestibule.

Elsewhere the external reinforced concrete has a natural, rubbed-down finish. Two large areas of concrete walling in the rear wing have an over-all, recessed pattern on their face formed by attaching shaped panels to the sheeting. The major area is left a natural concrete colour, but the recesses are emphasised by being painted blue-grey.

Clear, bold colours are used throughout; the roof structure of each rear secondary stair tower, for example, which consists of a cantilevered, folded slab, has its planes defined by painting them alternately blue and ivory. Terrazzo is used for the floors and staircases of the main halls and landings, thermoplastic tiles for secondary halls. Office floors are linoleum on $\frac{1}{4}$ in. asphalt.

Heating is by electrode boiler plant and thermal storage vessels charged at 'off-peak' periods; low-pressure hot water is circulated through thermostatically controlled convectors, recessed beneath the windows.

Electrical and other services are distributed by vertical ducts which connect the subway to each floor level.



View from south-east

Walcot House, Dover House and Laundry, Snow Hill, Bath

Architect: Terence W. Snailum [*F*]

THIS scheme, designed for the Bath City Council, was awarded the Architecture Bronze Medal in the area of the Wessex Federal Society of Architects for the three-year period ending 31 December 1956.

Until clearance, this site of nearly eight acres in area consisted of a maze of small streets and steeply sloping and stepped alleyways, with small industrial-revolution cottage development.

The buildings concerned are the first in a scheme of slum clearance redevelopment and the completed scheme will provide for a population of approximately 1,000 persons as against a previous population of about 700.

The site slopes very steeply away from the north side of the main London Road and the high costs of roads, services and foundations were one of the main considerations in the problem of replanning. The contours were the governing factor in the layout of the site and in the design of the individual blocks of buildings, and the general approach has been to provide long terrace blocks along the contours in the idiom of Bath, with one block across the contours for contrast and one point block to provide a visual focus for the scheme.

The general slope of the site is approximately 1 in 5 and there are no separate retaining walls in the scheme as the necessary changes of ground level occur at the blocks of buildings which act as retaining walls in themselves. This enables the ground around the buildings to be grassed at a slope of approximately 1 in 3½ on which it is possible to use a mower.

Walcot House, the lower of the two blocks concerned, contains 18 two-bedroom flats, and 6 bed-sitting room flats; and Dover House contains 24 two-bedroom flats and 8 bed-sitting room flats. The bed-sitting room flats for old people occupy the front or south portion of the ground floors, whilst the back portion of these same floors, partially underground, are used for stores, bins and other ancillaries.

The two blocks are linked by a grassed slope with paths and steps. The laundry block adjoins Dover House, and is equipped to provide washing and drying facilities for the first stage of development. There is also a small open air drying-ground with pierced screen walls.

All foundations were piled owing to the low load-bearing value of the sub-soil, and the general construction is traditional with load-bearing walls. External walls are faced in natural Bath Stone rangework. The roofs are surfaced in copper at a pitch of 20 degrees.

Mr. Snailum was assisted by Mr. R. G. Quick [*A*].

Above: Dover House and the Laundry

The slope of the site is about 1 in 5

View from the Point Block, which is nearing completion

Review of Construction and Materials

This section gives technical and general information. The following bodies deal with specialised branches of research and will willingly answer inquiries.
The Director, The Building Research Station, Garston, near Watford, Herts. Telephone: Garston 4040.
The Officer-in-charge, The Building Research Station Scottish Laboratory, Thorntonhall, near Glasgow. Telephone: Busby 1171.
The Director: The Forest Products Research Laboratory, Princes Risborough, Bucks. Telephone: Princes Risborough 101.
*The Director, the British Standards Institution, 2 Park Street, London, W.*1. *Telephone: Mayfair* 9000.
*The Director, The Building Centre, 26 Store Street, Tottenham Court Road, London, W.C.*1. *Telephone: Museum* 5400 (10 *lines*).
*The Director, The Scottish Building Centre, 425–7 Sauchiehall Street, Glasgow, C.*2. *Telephone: Douglas* 0372.

Competition for Technical Literature. In the April issue of this year's JOURNAL (page 241) an announcement was made of a competition, sponsored by the R.I.B.A. and the Building Centre, for manufacturers' trade and technical literature. The results have now been announced, as given below.

There were two classes of entry, Class I being for literature consisting mainly of technical information devised to give information on design, methods of application, standards of workmanship, maintenance, etc., as applied to a class or group of products or services rather than to those of a single manufacturer. Class II was for literature offering technical information on the use and application of a product, products or services of a single manufacturer.

Certificates of Exceptional Merit. Class I. The Natural Asphalte Mine-Owners and Manufacturers' Council. Class II. Hammond and Champness Ltd.

Certificates of Merit. Class I. British Cast Concrete Federation. Joint entry of the Coal Utilisation Council, and the Solid Smokeless Fuels Federation. The Modular Society. Domestic Insulation Committee of the Solid Fuel, Gas and Electricity Industry. Class II. Langley (London) Ltd., Troughton and Young Ltd., Crittall Manufacturing Company Ltd., British Ropes Ltd., Twyfords Ltd.

Honourable Mentions. Gyproc Products Ltd., Carter and Company Ltd., Copperad Ltd., Pilkington Brothers Ltd., Bowater Sales Company Ltd., Morris Singer Company Ltd., Imperial Chemical Industries Ltd., British Aluminium Company Ltd., Marley Tile Company Ltd., Celotex Ltd., The Standard Range and Foundry Ltd., Holoplast Ltd., The Armstrong Cork Company Ltd., The Brightside Engineering Company Ltd., Falk Stadelmann and Company Ltd.

Commended. Entries from the following firms did not conform with the provisions of B.S. 1311: 1955 as to size, but were otherwise commended by the assessors. British Paints Ltd., Secomastic Ltd., The Merchant Adventurers, B. Finch and Company Ltd.

Design in Asbestos Cement. In our October issue (page 500) it was announced that the Universal Asbestos Manufacturers' Group had appointed Mr. Edward D. Mills [*F*] as their consultant architect, so that they might 'keep in step with modern architectural thought in the way of product design and presentation'. It is now announced that Messrs. Turners Asbestos Cement Company Ltd. have retained Mr. H. T. Cadbury-Brown [*F*] as consulting designer to assist in the future designing of their asbestos cement products, to meet the continued changes of building trends.

It will no doubt be generally agreed that asbestos cement, in itself, does not possess highly aesthetic qualities, nor is its reputation enhanced by being associated in the general mind with inexpensive building, but in the hands of a good designer it can be used to advantage, and therefore the appointment of these two eminent architects is to be welcomed, and the profession will look forward to interesting results.

National Inspection Council for Electrical Installation Contracting. This Council received their certificate of incorporation on 10 August 1956. The executive body of the Council is the National Inspection Board, whose members are ex-officio members of the Council.

The main object of the National Inspection Council, as given in the memorandum of association, is 'To protect consumers of electricity against faulty, unsafe and otherwise unsound electrical installations and appliances'. To this end 14 inspection engineers have been appointed, that is, one approximately to the area of each Area Electricity Board in England and Wales, and two in Scotland. The Council maintain a roll of approved electrical installation contractors, whose work is subjected to routine tests by the inspecting engineers, who report to head office.

In the case of applications for enrolment the inspecting engineer of the area makes at least three inspections of installation work carried out by the applicant, and his report, together with the form of application, is considered by the Board and the application is either approved, rejected, or deferred for a later inspection after an interval of six months.

A progress report issued by the Council states that practically all the large contractors in the country, and probably about 50 per cent of all firms carrying out contracting work, are on the roll and are responsible for something like 85 per cent of the contracting work done in the country, but as the total cost of contracting work runs annually into many millions of pounds the remaining 15 per cent represents a very considerable total and is largely confined to wiring installations in houses, small commercial premises and farms. It is therefore to the small commercial firm, the householder, and the farmer that the National Inspection Council are of particular importance, especially as they are largely and powerfully sponsored by the electrical supply industry for the purpose of raising the standard of electrical installation contracting, especially in smaller work.

The R.I.B.A. is represented on the Council by Mr. T. Mitchell [*A*]. The headquarters are at 13 Victoria Street, London, S.W.1.

Unilux Translucent Sheeting. This sheeting is made by a thermosetting process from clear polyester resins reinforced with glass fibre mat. It is claimed that it gives shadowless natural lighting and has a light transmission factor of 85 per cent. The corrugated sheets conform with all standard profiles of roofing sheets and are of corresponding widths. Being made by a continuous production process the length of the sheets is limited only by convenience in handling.

The nominal thickness is $\frac{1}{16}$ in., the weight is 7 to 8 oz. per sq. ft. The material can be cut and drilled with ordinary tools, and the makers state that it is not affected by atmospheric or industrial fumes or by temperature variations and that it is shatterproof. The thermal conductivity is given as 1·5 B.t.u. There is a comprehensive range of colours.

Unilux is made by U.A.M. Plastics Ltd., of Tolpits, Watford, Herts.

Codes of Practice Recently Published

C.P. 2001: 1957. **Site Investigations.** This publication brings up to date Civil Engineering Code No. 1, which was originally published in 1950 by the Institution of Civil Engineers. It deals mainly with the investigation of the suitability and characteristics of sites as they affect the design and construction of civil engineering works and the security of neighbouring structures.

The Code includes a section dealing with the definitions, descriptions and classification of soils and rocks, including a summary *Basis for field identification and classification of soils.* General considerations governing site investigations are dealt with under the following heads; types of investigation, site exploration, methods of sampling, and field tests in situ. A complement to one appendix deals with special information required for design and construction. The Code can be obtained from the sales branch of the British Standards Institution, 2 Park Street, London, W.1. Price 20*s.*

Interbau, Berlin, 1957

THERE ARE SEVERAL elementary criticisms which can be made about the siting of the new permanent residential buildings which constitute the main part of the Interbau exhibition in the Hansa district of Berlin. The site is flanked on the west and north by the elevated railway and a large number of the flats are concentrated in tower blocks very close to this disturbing source of noise. A dual carriage highway (closed during the exhibition) bisects the site, which is unfortunate. It is obviously desirable that within residential areas main transport services should be neither seen nor heard. The layout as a whole is in the romantic Scandinavian tradition; there is no very discernible pattern and no clear—let alone tight—relationship between the blocks; grass, shrubbery, flowers and twisting paths separate the buildings producing a very suburban effect which is not without its attractions but at the same time not as urban as one would expect so near to the centre of a city. Perhaps this form of layout was influenced by the decision to employ many architects of different nationalities, producing a form of development which is, in a way, more comparable to an open air sculpture exhibition than urban renewal. Unfortunately in this case the exhibits are so blown up in scale that their competing styles are not unified by the landscape but are, on the contrary, very discordant; judged as an exhibition this is excusable but such lack of harmony will be irritatingly apparent in the years to come as the buildings are permanent. Nor are the big individual blocks—such as are completed—the works of art which one expects from some of the architects employed. It is difficult to believe that Gropius or Aalto could have had much to do with the buildings attributed to them—although some of the interior of the latter's building is interesting behind its grim façade. The high slab block by the Swedes, Janeacke and Samuelson, reveals some very thoughtful internal planning—particularly the relationship between bathroom, laundry, kitchen and living area—but the crudely applied elevations in front of too narrow balconies is suggestive of very immature students' work. Pierre Vago's block is conspicuous for the perversely contrived carpet patterning of its exterior and its mildly interesting sectional planning.

There is much more real architecture in some of the smaller buildings. A four-storey block of flats by Gottwald is a model example of free planning within a simple structural framework. Many of the partitions are removable so that the flats may be subdivided to suit the requirements of different tenants; thus, within the same building, it is possible to meet the needs of a family requiring several complete rooms or, alternatively, the space may be treated openly —with only the suggestion of partitioning —providing a civilised environment for the sophisticated. The access lobbies and stairs in this block are well designed and generous in scale. The most enchanting dwellings were Eduard Ludwig's courthouses which fulfil the ideal of single family houses in an urban setting. They are tranquil oases providing complete privacy and meeting the introverted needs of family life. It was interesting to observe the absence of overshadowing even in the narrow entrance forecourts, particularly when one remembers that the latitude of Berlin is comparable to that of London. The crisp yet gentle subdivision of space, and the blending of the interior with the exterior, suggests how the Englishman's plot might be his playground instead of his home his castle (particularly when his town castle is scaled down to the two-storey battlements that glare bleakly at one another, row after endless row, in our hideous urban sprawl).

The social buildings within this new development include two new churches, schools, a library, a small cinema, some shops and restaurants. The new churches are disappointing, although the interior of the Catholic one is the more rewarding. Werner Düttman's library is a single storey building enclosing a central courtyard. This building and the single storey group containing cinema, restaurant, and shops also enclosing an internal court, are crisply designed and reveal a very sensitive use of materials. There are, of course, many charming incidents in the exhibition which will not remain as permanent features, such as the ski-lift which carries visitors from the Zoo station, and the open air café protected with awnings of coloured sailcloth stretched in the form of hyperbolic paraboloids. The exhibition entitled 'Die stadt von morgen' is a most excellent display under an elegant umbrella formed of canvas held aloft on a space frame. The standard of interior display and furnishing was very high throughout the exhibition; the extreme competence of many German architects and designers in this sphere was echoed in their contribution to the Milan Triennale this year.

The exhibition as a whole and the ultimate livability of the Hansa district would have been much improved if it had been carried out by the best German architects who are so obviously both skilful and sensitive; they have nothing to fear from the very mixed bag of foreign competition imported for the occasion.

Outside the Hansa district West Berlin is, of course, a building exhibition in itself. The vast new buildings near the Zoo suggest South American inspiration. Le Corbusier's Berlin type block of flats—although as yet far from complete—suggests, of course, le Corbusier. The saddle-shaped roof of Hugh Stubbins's Congress Hall is a strangely uncomfortable form from some viewpoints, although the building as a whole is unquestionably Brave New World Architecture; it is extraordinarily stimulating to move around it and within it. Out of the forty odd theatres and concert halls which have been built in Western Germany since 1945, the concert hall attached to the Berlin Academy of Music is not untypical; the exterior is distinguished, the foyers are very generous and the auditorium is decorated in an undistracting manner in which it is a pleasure to listen to music; it is needless to add that the acoustics are excellent. The exhibition of Berlin civil engineering held in the Charlottenburg Schloss must be one of the most informative and certainly the best displayed exhibitions ever designed on such a theme.

Reflecting on those aspects of Interbau which please and displease, one reaches certain conclusions. First, this exhibition is a courageous effort, particularly for a city like Berlin which, for all its incredible reconstruction in recent years, still has its utterly destroyed and desolate centre beyond the Brandenburg Tor as a grim reminder of the recent past, and as a town is still arbitrarily and artificially divided between East and West. Secondly, since many hundreds of millions are spent every year on housing in Europe—mostly incompetently spent so that this investment adds rapidly to the general ugliness of our environment and perpetuates values and techniques quite inappropriate to mid-twentieth century living—there would be considerable value if a regular exhibition on the scale of Interbau and dedicated to housing were to be held in different countries at intervals of two or three years; collected in such an exhibition should be not the chef d'œuvres of architectural lions but the contributions of any architects, in public or private practice, who have new ideas to display—or even new applications of old principles—regarding planning, equipment, building technique and—most important of all—something to say about the architectural grouping of buildings and their disposition in various surroundings so that they genuinely create a desirable and vital environment sympathetic to the good life. Conformity to the hygienic but only adequate standards regarding height, light, and space around buildings is the minimum too often accepted as sufficient. 'Firmness and commodity' are not difficult to achieve, 'delight' is far more difficult but no less essential; this theme deserves to be propagated as widely and as frequently as possible through the medium of large-scale exhibitions staged in different centres at regular intervals.

PETER CHAMBERLIN [*A*]

Science in the Public Service

Under the above title the Scientific Branch of the Public Health Department of the London County Council have published the annual report of the Scientific Adviser for the year 1956. The branch advises all the L.C.C.'s departments on scientific matters, the work being carried out in three groups of laboratories, at County Hall and at the northern and southern sewage outfall works at Becton and Crossness.

As the volume of paint used by the L.C.C. in a year must exceed half a million gallons the amount of money spent on the advisory service is a very small part of the annual total cost and is surely repaid by savings in maintenance. Difficulties on site continue to be caused more by faulty application than by inferior paint. The efforts of the branch to raise the quality of paint used by the Council have been very successful, but much remains to be done to raise the standard of painting of some contractors. The restricted 'Grade A' list of hard gloss paints has come into general use, and most of the Council's work is now carried out with paint supplied by manufacturers appearing on this list.

A 'Grade A' list of emulsion paints has been issued and this enables architects and others to specify an emulsion paint having a performance higher than average for those situations and conditions where this is necessary.

Of hard gloss Grade A paints 36 were approved and 53 rejected, and the percentage of paints rejected remained fairly constant, but the reasons for rejection showed marked differences compared with previous years. Among the reasons for rejection were poor surface finish, low opacity, low flexibility, excessive quantity of calcium carbonate and low scratch hardness. The branch noted several interesting points in the new distribution of reasons for rejection; for instance, the growing tendency to produce paints complying with the Council's requirements and those of Government specifications has led to improvements in opacity and scratch hardness but this has been offset—as a result of increasing pigment loadings and of using harder media—by a marked increase in the number of paints showing poor flexibility, particularly in exterior undercoats where flexibility is an important and necessary property.

During the year more than 900 samples of paint taken from sites were examined and nearly 100 defects or difficulties in decoration were investigated. Defects investigated included the following: small rust stains on precast concrete pillars painted with emulsion were found to be due to small particles of iron transferred from the moulds to the pillars during casting; discoloration of a flat paint used on a school ceiling was traced to the acidic fumes from gas space-heaters reacting with an acid-sensitive dyestuff in the paint; failure of paintwork on an asbestos. balcony panel was found to be due to the high water-susceptibility of the alkali-resistant primer used; cases of failure of paint on steelwork were due to incomplete removal of mill-scale; pattern staining of an emulsion paint on a vermiculite plaster wall was found to be due entirely to water retention in the wall after several months of occupation; cases of patchiness in flat and semi-gloss paints proved to be due to incomplete sealing of the surfaces before painting; failures of paint on metalwork were found to be due to incomplete preparation before painting or to the use of an incorrect type of primer. During the year the new B.S.2660 colour range was introduced and assistance on the practicability of using various colours in different types of finish was given to the departments concerned.

In the section on building materials the report states that many kinds of new materials which might with advantage be used in building were examined.

The variety of this work is indicated by some of the samples submitted for examination, such as 79 bituminous felts, 55 asphalts, 88 cement mortars, etc., 37 external finishes and cladding, 28 plastic building materials. One hundred and three visits to sites were paid. Many samples were received in connection with alleged faults, but these were often found to be in respect of workmanship or incorrect use rather than in quality of the material. The policy of maintaining touch with practical problems arising from the use of new materials or processes has led to a large increase in the number of visits to sites.

Most of the queries about site problems are perennial and fairly easily answered but others are more difficult, and the report mentions two cases of the expansive effect of freezing water on balconies which had been partially saturated by water from overflowing cisterns. Another case was that of erratic spalling of mortar from brickwork, where it was found that spalling occurred only when the sand used contained an excessive proportion of fine particles, resulting in a weak mortar which was more retentive of water. Consideration was given to improvements in the design of asphalt roofing with the idea of isolating the edge of the asphalt from the parapet wall to allow the asphalt to move freely over the felt underlay when subjected to thermal stress arising from direct sunshine.

An unusual example of apparent failure of an asphalt roof where deep fissures formed in concentric arcs was considered to arise from the use of overheated asphalt laid during the excessively cold weather of February. When the faulty area was cut out it was found that the fissures only partially penetrated the asphalt, but the inherent weakness and loss of 'flow' of the overheated asphalt would undoubtedly have resulted in early failure.

The report mentions two cases of defects in flashings; in one case soft super-purity aluminium flashing laid in long lengths to a coping had buckled when hot asphalt had been laid over the coping. The use of half-hard aluminium sheet in short lengths was found to be more suitable. The other case concerned the use of a bituminous felt type of flashing which had developed cracks when subjected to deformation in fixing. The limitations of this type of flashing were indicated and emphasis placed on the absolute necessity of softening the felt thoroughly by heating, when bending or moulding is required. The fall of a newly placed lime plaster ceiling was attributed to vibration caused by working on the floor above while the plaster was still in a weak condition, and apparently it was not realised that a lime plaster requires a very long undisturbed setting period.

The Scientific Adviser to the Council is Dr. S. G. Burgess, and the staff of the scientific branch numbers 26 graduates, 28 ancillary staff and five in a clerical section. The report is published at 1*s.* 3*d.* postage extra.

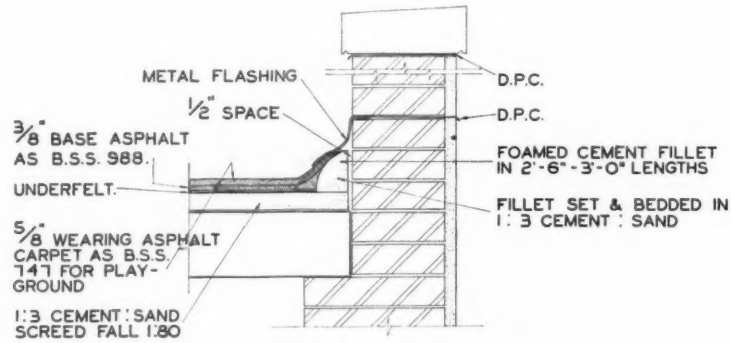


Diagram showing isolation of the edge of asphalt from a parapet wall

Architects' Specifications for Hardwood Joinery

ON 25 JUNE 1957 a meeting took place at the Royal Institute between the Industry Liaison Sub-Committee and representatives of the English Joinery Manufacturers' Association. The Association had asked for an opportunity to discuss with the Sub-Committee the question of architects' specifications for hardwood joinery. They stated that there was a tendency for some architects to be indefinite in their specifications for hardwood joinery. Terms like 'semi-hardwood', 'medium hardwood' and 'hardwood at x shillings per cubic foot' were, quite apart from their vagueness, sometimes completely meaningless. The expression 'oak to be first quality Riga or Memel' was completely out of date and had not been used by the Timber

Trade for at least 30 years. Specifications referring to hardwood at a particular price per cubic foot were not sufficiently precise, since any one of a dozen species could be supplied, each of which according to its qualities varied in the cost of manufacture. It would seem sensible for the architect to specify the exact species of hardwood he required, as the Association assumed that it was essential for the architect to know exactly what species of timber would suit his design.

These remarks, the representatives added, applied only to good quality, purpose-made joinery and did not apply to items covered by a British Standard in which hardwood was part only of the finished product, i.e. sills, thresholds or work tops.

The Industry Liaison Sub-Committee found themselves largely in agreement. They asked for a list of readily available hardwoods, which could be specified for good quality joinery, and were told that there were eight species which were commonly specified:—

OAK, all varieties	*Quercus Species.*
MAHOGANY, African	*Khaya ivorensis.*
American	*Swietenia Species.*
TEAK	*Tectona grandis.*
IROKO	*Chlorophora excelsa.*
OBECHE	*Triplochiton scleroxylon.*
WALNUT, African	*Lovoa klaineana.*
American	*Juglans nigra.*
European	*Juglans regia.*
Queensland	*Endiandra palmerstonii.*
MERANTI, all varieties	*Shorea species.*
AFRORMOSIA	*Afrormosia elata.*

(The woods are named in accordance with the specifications of B.S.S. 881 and 589: 1955 'Nomenclature of Commercial Timbers'.)

They were assured that these woods were now readily available—only American hardwoods were still difficult to obtain. The so-called 'reserve stock', which had resulted from bulk buying by the Government immediately after the war and from which in the past users had had to accept consignments was now almost exhausted.

The meeting agreed that existing publications covered too wide a variety of species for the architect when specifying. The representatives of the English Joinery Manufacturers' Association agreed, therefore, to investigate the possibility of producing a note of the most commonly used hardwoods readily available giving information such as the suitability of the wood and the cut to be specified for specific purposes, its cost, the reliability of its source, sizes commonly available and details of a limited number of veneers.

This note could not be made available to architects immediately, and the Sub-Committee therefore decided that an account of the discussion in the JOURNAL would draw architects' attention in the first instance to the desirability of more precise specifications for hardwood joinery.

Practice Notes

Edited by Charles Woodward[*A*]

MINISTRY OF HOUSING AND LOCAL GOVERNMENT. Green Belt Proposals. Further guidance on Green Belt proposals has now been given to local authorities in a Circular 50/57 issued by the Minister of Housing and Local Government (H.M.S.O. price 4*d.*). It states that a number of sketch plans have been received and considered by the Minister and that the authorities concerned can now proceed with formal proposals for the alteration of their Development Plans, and gives advice on the form of the submission. In particular, the Circular details methods of defining in a Development Plan the boundaries of a Green Belt and the authority's intentions for the control of new building in a Green Belt area.

The Circular stresses that the specially strict control in the Green Belts should not result in permission being given elsewhere for development which is inappropriate or detrimental to the countryside.

'There may be some pockets of land', states the Circular, 'between the town and the Green Belt, which are not to be developed within the present Plan period but which could be developed later without prejudice to the Green Belt. It would be misleading to allocate such areas now, but to include them in the Green Belt for the time being might give rise to difficulties and undermine public confidence in the Green Belt at a later date if it were then decided to allocate the land for development. Such areas may well be left as pockets of "white" land. They are then bound to be especially attractive to developers and it will be desirable to set out in the Written Statement the authority's policy for such areas in order to make it clear that they are not available for development at the present time.'

Housing. Circular 48/57 dated 20 September addressed to Housing Authorities in England refers to the procedure for submitting proposals for housing tenders, loan sanctions, etc., to the Department. A Memorandum is attached to the Circular and has been brought up to date.

Paragraph 11 of the Memorandum refers to the importance of prior consultation and agreement between the technical advisers of the local authority and of the Department in the case of proposals for the erection of blocks of flats or maisonettes where the complexity of the technical preparatory work is greater, and where the making of alterations at a subsequent stage involves greater difficulty. When a local authority decide to provide for the erection of blocks of flats in a scheme for building on a particular site, they should particularly instruct their advisers to get in touch with the Department in order to ensure effective prior consultation during the preparatory stages. Similarly, there should be consultation with the Department at an early stage when schemes are being prepared which incorporate unconventional methods of construction and new materials with a view to assuring themselves that the proposals will ultimately warrant a 60-year loan.

The Circular and Memorandum are obtainable at H.M. Stationery Office, price 1*s.* 3*d.* net.

PLANNING APPEAL DECISIONS

Use of dwelling-house for board residence. A local planning authority refused permission for a house to be used for 'casual board residence'. The grounds of refusal were that it was an inappropriate use out of keeping with the character of the neighbourhood having regard to the type of accommodation provided and the type of person for whom the appellant catered. (The proposed use was for men discharged from mental hospitals as being cured but requiring a period of home life before returning to their own surroundings.) A further reason for refusal was that the local planning authority believed that there was a restrictive covenant against the establishment of business uses in this locality and considered that they were justified in supporting the intention of such a covenant in a case of this kind.

In allowing the appeal the Minister agreed that the locality was primarily residential but could not accept that the use of a house of this size as a boarding house was inappropriate or that distinction can legitimately be drawn between one boarding house and another according to the type of person catered for. The Minister noted the statement of the local planning authority that there may be restrictive covenants applying to the property, but the enforcement of private covenants is not within his jurisdiction and he could find no adequate reason for withholding planning permission and has accordingly decided to allow the appeal. (JOURNAL OF PLANNING AND PROPERTY LAW, October 1957.)

(*Note.* Circular 58/51 was referred to in the September issue of the JOURNAL. The Circular said 'that the Town and Country Planning Act is an Act for regulating the development and use of land, and the powers which it confers are only available for those purposes. Conditions which have no relevance to planning have no place in a planning permission'. It would appear from the Minister's decision in this case that a local planning authority is not entitled to take into account any restrictive covenants that may apply to a property.)

Mock window in Bungalow. The following condition was imposed by the local planning authority in giving planning permission for the erection of a bungalow:—

The window opening of the proposed bedroom facing Broomhill Park Road to be enlarged by a mock panel so as to match in size the living-room window in the same elevation.

In allowing an appeal against this condition the Minister of Housing and Local Government stated that he was of the opinion that the mock window required by the condition was quite unnecessary to ensure that the external appearance of the

proposed building was satisfactory. (THE ESTATES GAZETTE, 12 October 1957.)

NATIONAL JOINT COUNCIL FOR THE BUILDING INDUSTRY. Regradings of Districts. The following is the List of Regradings authorised by the Council to take effect on and from Monday 7 October 1957:

Midlands Region

Alcester R.D. (part) Sambourn and Studley	From A1 to A
Malvern U.D.	A1 „ A
Melton Mowbray U.D... ..	A1 „ A
Stamford M.B.	A1 „ A
Stone R.D. (part), Eccleshall (part), Chebsey (part), Sandon (part), Stone R. (part) ..	A1 „ A
Tamworth R.D. (part), Amington, Austrey, Bolehill and Glascote, Kingsbury, Newton Regis, Seckington, Shuttington	A1 „ A

Southern Counties Region

Amersham Rural District and Chesham Urban District, excluding those portions within Beaconsfield and Bourne End Grading Districts ..	From A1 to A

The effect of this regrading is to raise the wages of craftsmen and labourers by ½*d.* per hour in the districts mentioned above.

In current contracts under the R.I.B.A. Contract there will thus be a net addition to the Contract Sum as from 7 October.

LAW CASE

Sign overhanging adjoining premises. In Kelsen *v.* Imperial Tobacco Co. (of Great Britain and Ireland) Ltd., the plaintiff was the lessee of single-storey premises where he carried on the business of a tobacconist. The adjoining building was of three storeys and on the wall above the plaintiff's shop the defendants displayed the sign 'Players Please'. This sign projected into the air space above the plaintiff's shop a distance of some eight inches. Business disputes having arisen between the plaintiff and the defendants, the plaintiff gave formal notice to the defendants to withdraw the sign on the ground that it was misleading to his customers. He then brought this action seeking to obtain an injunction requiring the defendants to remove the sign, claiming that by fixing the sign in that position they had trespassed on his air space and threatened to continue to do so unless restrained by the Court.

The claim was resisted on a number of grounds but that of most general interest was that a mere invasion of superincumbent air space did not amount to trespass, but amounted merely to nuisance from which it would follow that as on the facts the presence of the sign did the plaintiffs no harm, no nuisance existed. His Lordship found that there was nothing in the plaintiff's lease which displaced the conclusions in law that the air space above the premises were part of the premises leased. Further, on the authorities he found that the sign projecting as it did was not a mere nuisance but a trespass on the plaintiff's property. That being the case the question remained as to whether the proper remedy was in damages or by way of injunction, which is a matter in the discretion of the Court.

His Lordship decided that in this case damages, which could only be nominal as the sign did the plaintiff no harm nor diminish the enjoyment of his property would hardly be an adequate remedy and would not prevent the defendants continuing to display the sign. Bearing in mind that both parties, in pursuance of what they claimed to be their business interests had attempted to bring commercial pressure to bear one on the other, his Lordship felt that this was a proper case for the Court to issue a mandatory injunction that such portion of the sign as projected over the plaintiff's premises be removed within 28 days. (1957. *All England Law Reports.* Vol. 2, p. 343.) (THE NATIONAL BUILDER.)

WAR DAMAGE COMMISSION AND CENTRAL LAND BOARD. The undermentioned Regional offices of the War Damage Commission and Central Land Board have been closed and their work has been transferred to London offices as shown:—

Offices closed	War Damage work transferred to:—
Eastern Region	
Block D, Government Buildings, Brooklands Avenue, Cambridge.	The War Damage Commission, City Gate House, Finsbury Square, London, E.C.2.
Area covered: Norfolk, Suffolk, Cambridgeshire, Huntingdonshire, Bedfordshire, Hertfordshire and Essex.	
Southern Region	
Whiteknights, Earley, Reading.	The War Damage Commission, Government Building, Bromyard Avenue, Acton, London, W.3. (Except work connected with *churches* which has been transferred to the Commission's office at City Gate House, Finsbury Square, London, E.C.2.)
Area covered: Buckinghamshire, Oxfordshire, Berkshire, Dorsetshire, Hampshire, Isle of Wight.	

The Central Land Board work of the closed offices has been transferred to: The Central Land Board, 246 Stockwell Road, Brixton, London, S.W.9.

War Damage: Technical centres will be maintained at Norwich, Portsmouth and Southampton.

Third Conference of Cathedral Architects

FROM TIME TO TIME it has been found useful to organise conferences at which the architects in charge of cathedrals can discuss common problems met with in the repair and maintenance of these exceptionally important ancient buildings.

A third conference was arranged at the York Institute of Architectural Studies by the Cathedrals Advisory Committee on 27–29 September, and was attended by 27 architects in charge of cathedrals, and nine others who are responsible for the greater abbey and minster churches.

Discussion subjects and papers included cleaning, preservation and repair of stonework, roof coverings—traditional and non-traditional—heating, acoustics, and the treatment of timber pests. The work in progress at York Minster was inspected under the guidance of Professor Sir Albert Richardson, P.-P.R.A. [*F*], the architect in charge, and Mr. W. J. Green, Clerk of Works.

The Conference, in the course of its sessions, came to certain conclusions, which were summarised in the Resolution below:

This Conference views with dismay the decrease in the numbers of architects, builders and craftsmen skilled in the special problems of repairing churches and other old buildings, and urges the Central Council for the Care of Churches and other interested bodies to take all steps in their power:—

(*a*) To provide greatly increased facilities for the practical training of young architects in such work, on the general lines so admirably started at the York Institute of Architectural Study;

(*b*) To encourage small country builders to maintain the skilled staff and direction they still possess, by helping to arrange a steadier progression of work without sharp fluctuations in activity;

(*c*) To lower the cost of importing experienced builders into districts where the required knowledge no longer exists, by arranging continuity of work on buildings which are conveniently grouped geographically;

(*d*) Remembering the experience gained at Manchester Cathedral, to increase the number of apprentices in crafts where skilled men are now in short supply.

Correspondence

REPRESENTATION OF SALARIED ARCHITECTS AND STRUCTURE OF THE PROFESSION

The Editor, R.I.B.A. Journal

SIR,—The A.B.T., which can claim at least some success over the years in representing salaried architects, is naturally interested in Mr. Sheppard's statement which appeared in your September 1957 issue. After all, any organisation such as ours which has been operating in this field for many years, with very little encouragement and far too often actual obstruction and hostility, can surely only welcome any move which is likely to bring about more effective representation for local government architects through the N.J.C.

However, there are many questions which architects must ask themselves in considering Mr. Sheppard's proposal. Firstly, why must 'any society seeking recognition as a negotiating body . . . be limited to local government officers' when the National Union of General and Municipal Workers, the Transport and General Workers' Union and the Confederation of Health Service Employees all have seats on the N.J.C. itself? Certainly these organisations are not confined to local government.

Secondly, what 'enough good works' could the proposed society undertake if it is not able to perform the function for which it is proposed to be set up? Surely, apart from purely trade union activities any 'good works' undertaken by an R.I.B.A.-inspired body would be better undertaken by the R.I.B.A. itself, which is why the members pay their fees.

The main query must be, however, whether Mr. Sheppard and his associates can guarantee effective representation on the N.J.C. by the formation of another society along the lines he has outlined. Only if he can do so can there be any justification for suggesting this further fragmentation of the profession.

Yours faithfully,

F. E. SHROSBREE
General Secretary,
Association of Building Technicians

LE NOUVEAU VISAGE

DEAR SIR,—Referring to the debate 'that systems of proportion make good design easier and bad design more difficult' reported in the September issue of the JOURNAL with the cover illustration entitled 'The new look of the Albert Embankment', it occurs to me that there must be a sardonically humorous connexion between the two.

These buildings may be an expression of our age but they are not beautiful; or are they? My wife tells me they resemble wireless cabinets.

What subtle system of proportion, if any, underlies the creation of elevations such as these?

The river front here, constituting as it does the finest site in the capital city of the Commonwealth, is worthy of more sympathetic treatment.

Yours faithfully,

HORACE H. LAWS [*A*]

ARCHITECT-DESIGNED STAMP

SIR,—Following your Editorial on the Libyan stamp in the October issue of the JOURNAL, you may also be interested to know that the enclosed 25c. stamp of Sarawak, issued in a series of 14 on 1 October, has been designed by myself.

The design, awarded a $300 prize in an open competition held in 1955, represents the former residence of the white Rajah of Sarawak, Sir Charles Vyner Brooke, until it became a Crown Colony in 1946.

Yours faithfully,

K. M. MUNNICH [*A*]

REVISED SYLLABUSES FOR THE R.I.B.A. INTERMEDIATE, FINAL AND SPECIAL FINAL EXAMINATIONS

The Council, on the recommendation of the Board of Architectural Education, have approved a revised syllabus for the R.I.B.A. Intermediate Examination, which will come into operation on 1 November, 1960. They have also approved a revised syllabus for the Final and Special Final Examinations to come into operation on 1 November, 1962.

A memorandum showing how the new regulations and syllabuses differ from those at present in use has been prepared.

Copies of the explanatory memorandum, of the revised syllabuses and specimen examination question papers, and of the revised memoranda for the guidance of those preparing for the examinations, can be obtained on application to the Royal Institute.

A revised list of books recommended for study is being prepared, based on the new syllabuses. A separate announcement will be made regarding the date upon which the list of books will be available.

Attention is specially called also to the fact that the Council of the Royal Institute have asked the Board of Architectural Education to consider the co-ordination of the R.I.B.A. examination system with the examination systems in operation in the various parts of the British Commonwealth. It is possible, therefore, that some rearrangement of the revised syllabuses may become necessary as the result of the negotiations with the Allied Societies in the Commonwealth.

Book Reviews

History of Architectural Development. Volume I. **Ancient and Classical.** Revision of Simpson's History, by *Hugh Plommer.* 8¾ in. xxii + 384 pp. incl. illus. + 24 pls. Longmans, Green and Co. 1956. £1 15*s.*

The revised version of Volume I of Simpson's *History of Architectural Development* bears so little resemblance, either in form or content, to the original work that one is tempted to wonder why the original title had been retained, or why, indeed, Dr. Hugh Plommer, with scholarship enough for a similar work on his own, was persuaded to participate in the revision at all.

A good third of the former edition having been devoted to Early Christian and Byzantine—now rewritten by Mr. Cecil Stewart in a completely new volume—Dr. Plommer was left with some 50 pages each on the Ancient East and Greek architecture, and a little more on the buildings of the Romans. Simpson's book was certainly due for revision. Researches since 1904, when it was first written, have brought to light much fresh evidence on these early periods, with the result that many of its facts, its illustrations as well as its general attitude to architectural history, had become sadly dated. Nevertheless the book had virtues of clarity and simplicity, which appealed to the general reader and to students of architecture. The new version lacks this simplicity, and may well leave the average student a little bewildered by the frequent digressions which disturb the continuity of the story, and by the maze of cross references to other works, many of which are not readily available to the general reader.

If, as one supposes, this new version is intended mainly for the student anxious to acquire a basic and not specialist knowledge of architectural history, then its very erudition may prove to be its undoing. One wonders how many achitectural students are really very concerned about what . . . 'Schaffer says', what . . . 'Childe notes', or who even pretend to be interested in Puchstein, Persson, Englebach, or Jéquier? Let's face it . . . none. On the other hand, for the serious Classics scholar and, as Dr. Plommer describes him, the enterprising student, these references are interesting and important. But at the same time there is a great deal that even this class of reader may find tedious. He must be excused if he refuses to accept some of the author's strong personal views, or if he joins in sympathy with the younger reader in skipping most of the chapter on the Greek Orders as offering very little new thought on a too well worn theme. It is right and proper that we should be reminded, as the sales blurb on the jacket does, about symmetry and order and the other virtues of the Grand Manner, but if the lesson is to have any real effect today it will have to be taught with greater subtlety than by reference to the Orders of Architecture.

Even though it may be said that Dr. Plommer has done some unprofitable rolling around of stones that have long

since lost what moss they may have had, he has at the same time turned over others in a way which should encourage scholars to look again at matters that have escaped notice for many years. He has done a great deal of very valuable research work in the preparation of this book which, it is to be hoped, he will one day fully expand into a larger and more comprehensive study of the period, entirely from his own pen.

EVELYN FREETH [A]

South German Baroque, by *T. H. B. Burrough*. 9¾ in. 40 pp. incl. illus. + 36 pp. of illus. Tiranti. 1956. 18*s*.

One might describe this as a preliminary sketch for a valuable book. Mr. Burrough enjoys Baroque and wonders why the English generally do not. He is surprised at our enthusiasm for the music of Mozart and our disinterestedness in the architecture which, he says, so perfectly mirrors it. Probably the answer can be found in the British character which tends to be distressed—if not shocked—by an ecclesiastical building looking gay outside and definitely frivolous inside. Hence this essay in praise of ten large churches built in that romantic country south and south-east of Ulm, between the years 1686 and 1772. It is illustrated with sketch-plans (all drawn to the same scale) and admirable photographs. The commentary, too, is excellent. But one would have liked more of it on each building or, perhaps, half the number of buildings discussed. And the introduction is very diffuse. Much of it pursues the nature of Baroque in the widest sense—too wide for an appreciation of one local flourish of this instrument of the Counter-Reformation. Mr. Burrough rightly defines Baroque as a revolt from orthodox Classicism; but he works the analogy of late Gothic and other styles too hard. It is agreeable to think of Borromini, for instance, as the expert at loosening the restrictive influence of Palladio's regulations, or to follow Longhena into his delightful convulsions, and call *that* Baroque. But to apply the same term to the later phases of all the great styles is unnecessary. It cheapens the Erectheion to label it Greek Baroque in relation to the Parthenon.

Nevertheless, what the author says about the ultra-Baroque, the positively rococo work which he illustrates is an advance on the usual total denunciation; for he explains that such buildings are no longer designed as architecture with spaces allotted to sculptors and painters; but that they *are* sculpture, much of which is handed over to the painters to paint, and the more trompe-l'oeil there is the jollier we are. Quite so; but these larks with structure can be good and bad in their effect. The interior of that demure pilgrimage church at Birnau on Lake Constance, designed by Peter Thumb about 1750, appears to have lost all decency of *form* under the unbridled enrichments of three or four decorators; and the proportions of the really magnificent High Altar at Weingarten are destroyed because its lowest third is obliterated by the very rich choir screen—a brilliantly clever exercise in false perspective by G. A. Corbellini in iron no more than two inches thick.

Mr. Burrough's small ink sketches of the church exteriors are adequate and pleasantly suggestive. He includes one of the west front of St. Paul's to compare with the west end of Weingarten Abbey church, but it seems he failed to notice the much closer resemblance of the curved German front to the *east* end of Wren's cathedral, with its apse. Both have that tiara-like flourish of the attic crowning them, which is probably the most baroque feature of St. Paul's. It is related to the gable treatment of that beautiful west front at Zwiefalten by J. M. Fischer.

One feels, after absorbing the photography in this book, that there are one or two buildings in that part of Germany which deserve much deeper appreciation and even very careful measuring; that curving front of Ettal for instance, 200 feet wide with its dome growing out of it; or a detailed study of those clustered Corinthian piers inside the great church at Weingarten with the repeated angles of the entablature so deliciously crinkled upwards. The *humanity* of this work might soften the education at least of our students today.

A. S. G. BUTLER [F]

Counter Attack against Subtopia, by *Ian Nairn*. 12¼ in. 86 pp. illus. Architectural Press. 1957. 12*s*. 6*d*.

Most architects will probably have seen this special number of the ARCHITECTURAL REVIEW, now reprinted in book form; and the more the better. After his destructive criticisms in *Outrage*, Mr. Nairn has produced a collection of encouraging examples, including some English, of successful design in town and landscape. The arrangement is good, and makes clear what we are to commend and what to condemn. The line drawings, however, are not always distinguished, even when they praise; nor is the occasional brown paper, which is especially unsuitable for half-tones, an attractive feature.

The vital questions are clearly stated and sanely answered. In particular, the castigation of land-waste, contributed by Mr. Walter Manthorpe, demands either an explanation or a drastic change in planning policy. Even without entering the contentious argument about high blocks of flats, this survey shows that high density, which prevails in many high-class neighbourhoods and in good modern terraced housing, does not impair amenity, but on the contrary leaves more of the countryside intact.

Another eminent contributor, Miss Elizabeth Denby, denies the need for so much 'overspill' and 'decentralisation' (euphemisms!) and shows that most towns with overcrowded areas also contain undercrowded, even derelict ones; it is criminal folly to expand the city before building wherever possible within its perimeter—but perhaps cheaper?

Some other parts of the book are less convincing, and ammunition is wasted on rather trivial targets. For example, the actual-and-ideal sketches on pages 359–60, show a church steeple magically rebuilt but on page 378 the church's banner appealing for funds is apparently frowned on. Signs and signposts are useless, if not conspicuous. And is Mr. Nairn seriously proposing to 'gather up the scattered buildings', however unsightly?

The final chapter outlines the system of centralised planning authority which seems essential, if England is not to degenerate into a single, dingy conurbation. M. W.

Small Commercial Buildings, by *R. W. Snibbe*. 12 in. 216 pp., 300 illus. New York, Reinhold. London: Chapman and Hall. 1956. £5 8*s*.

This title is a little misleading to British readers, with its inclusion of clinics, camps, theatres, bars, residential buildings and a mortuary. Also, despite the various countries included, 85 per cent of the examples are American. There the average standard of small town commercial building appears to be no better than ours, and the object of the book is to educate the layman and the businessman on Main Street rather than the architect. One hopes it will have this effect, although the necessary lessons of reticence and calmness are barely conveyed.

The best example of these qualities is the gracefully precise and appropriate design of the German petrol station at Wiesbaden. Of American architecture, works such as William Beckett's own office are useful examples of a native ability to use broad areas of material and colour in a fresh and confident manner. One feels that Americans could really distinguish themselves with this type of building: generally they do not seem to handle ribby 'cladding' (more modishly described as 'envelopes') quite so well.

Perhaps a little New Brutalism or pioneer modern, and a sprinkling of F.L.W., would have offset some of the 'contemporary' mannerisms. The book will probably serve its purpose, however, of 'inspiring people into wanting more beautiful buildings' and of proving that this will be 'more profitable to the owner'.

JOHN CUNNINGHAM [A]

The Châteaux of France, by *Ralph Dutton*. 9 in. 272 pp., illus. Batsford. 1957. £1 15*s*.

For a good many years now Ralph Dutton has been producing books on the historic architecture of England and France. He is a modest author, who does not set his sights very high: but he has two important qualities; he writes beautifully and his information is sufficiently detailed and accurate to satisfy all but the pure specialist.

His latest work is a simple study of the evolution of French country-house architecture from the beginning of the 15th century to the time of the first Napoleon; although divided into periods, it can be conveniently used as a guide to the buildings themselves. In fact, it seems to be exactly what the educated traveller needs. Particularly useful features are a list of about 100 châteaux open to the public, with the days and times of opening, and a map showing their locations. There are plenty of photographs, but few plans. J. C. P.

Notes and Notices

NOTICES

Second General Meeting, Tuesday 10 December 1957, at 6 p.m. The Second General Meeting of the Session 1957–58 will be held on Tuesday 10 December 1957 at 6 p.m., for the following purposes:

To read the Minutes of the Inaugural General Meeting held on 5 November 1957; formally to admit new members attending for the first time since their election.

Sir John Cockcroft, O.M., K.C.B., C.B.E., F.R.S., Ph.D., D.Sc., Director of the Atomic Energy Research Establishment, Harwell, to read a paper on 'Architectural and Building Requirements as Related to Atomic Energy'.

(Light refreshments will be provided before the meeting.)

Illuminating Engineering Society Lecture Series at the R.I.B.A. The Illuminating Engineering Society are holding at the R.I.B.A. a series of lectures for their members, the purpose of which is to explain the principles which are guiding forward-looking architects at the present time, both generally and in relation to certain building types. Arranged with the help of the R.I.B.A. Science Committee, they are intended to be the sort of lectures that are given by the B.B.C. to explain, for instance, the meaning of modern music to the layman.

The first lecture by Mr. H. T. Cadbury-Brown [*F*] on 7 November is general in its scope and will be called 'A Review of Present Architectural Thoughts and Trends'. The second, on 14 November, by Mr. David Medd [*A*], and the third, on 21 November, by Mr. John Bickerdike [*A*], are semi-technical with the titles 'School Design', and 'Modern Planning Trends in Office Buildings and Factories', respectively. The series will be concluded by Mr. Bryan Westwood [*F*], on 'Planning the Interior: The Expression of Current Ideas and Requirements.'

The lectures which are part of the Illuminating Engineering Society's programme of meetings for the 1957–58 session commence at 6 p.m. and are open to the public and the Society extends a welcome to anyone who wishes to attend.

Architectural Competition—Assessors' Awards. All architects who take part in architectural competitions are reminded by the Council of the R.I.B.A. that participation in a competition is a definite acceptance of the principle that the award of the assessors is final and binding upon themselves as well as upon the promoters, and that any competitor who feels that he has real ground for dissatisfaction with an assessor's award should communicate with the Secretary of the R.I.B.A.

Further, all architects, whether competitors or otherwise, are reminded that discussion or correspondence in the public or professional press which tends to criticism or disparagement of an assessor or award cannot alter the final and binding effect of the award, but may prejudice architects and the whole competition system in the opinion of the public, and is therefore highly undesirable.

The Acceptance of Pupils and Junior Assistants and the Probationership of the R.I.B.A. The Board of Architectural Education have noticed that the practice still persists of members accepting pupils or junior assistants without satisfying themselves that such pupils or junior assistants have reached the necessary standard of general education for the Probationership. Members are reminded that it is most important that they should not take boys or girls into their offices unless they possess one of the qualifications laid down.

A list of the recognised examinations can be obtained on application to the Secretary, R.I.B.A.

British Architects' Conference 1958. The British Architects' Conference 1958 will be held at Newcastle upon Tyne from 14 to 17 May at the invitation of the Northern Architectural Association. Full details of the programme will be published in due course. Particulars of accommodation in hotels will be published in an early issue of the JOURNAL.

R.I.B.A. London Architecture Bronze Medal 1957. The attention of members is called to the form of nomination and conditions of the award, enclosed with this issue of the JOURNAL. The award will be made for a building built within the counties of London and Middlesex during the three years ending 31 December 1957. Any member of the Royal Institute may nominate any building for consideration by the Jury.

Nomination forms must be returned to the Secretary, R.I.B.A., not later than 28 February 1958.

Associates and the Fellowship. Associates who are eligible and desirous of transferring to the Fellowship are reminded that as from 1 January 1956 all candidates for the Fellowship are required to submit to the Fellowship Examiners drawings and photographs or examples of work. Candidates may also be required to attend for an interview, which may however be dispensed with at the discretion of the Fellowship Examiners. The necessary nomination forms may be obtained from the Secretary, R.I.B.A.

Licentiates and the Fellowship. By a resolution of the Council passed on 4 April 1938 all candidates whose work is approved are required to sit for the Examination, which is the design portion of the Special Final Examination, and no candidates will be exempted from the Examination.

Note.—The above resolution does not affect Licentiates of over 60 years of age applying under Section IV, Clause 4 (*c*) (ii) of the Supplemental Charter of 1925.

COMPETITIONS

Development of the Leith Fort Housing Area. Last day for submitting designs: 30 November 1957.

Full particulars were published in the JOURNAL for June, page 342.

Civic Centre for the Borough of Enfield. Last day for submitting designs: 18 November 1957.

Full particulars were published in the JOURNAL for May, page 287.

International Competitions. A note has been received from the International Union of Architects that the conditions of the following competitions have been approved by them:

City Hall and Square for Toronto, Canada. Some particulars were published in the JOURNAL for October, page 511. The following additional information is now available:—

Every intending competitor must register his name and address in writing with the Professional Adviser (using the page given in the Conditions for the purpose) by 22 November 1957. Questions must reach the Professional Adviser not later than 6 December 1957.

Last date for dispatch of submissions in the preliminary competition: 28 March 1958.

Last date for dispatch of submissions in the final competition: 29 August 1958.

Development of Berlin Centre. Last day for submitting designs: 1 February 1958.

Full particulars were published in the JOURNAL for May, page 287, with an amendment in the JOURNAL for October, page 511.

BOARD OF ARCHITECTURAL EDUCATION

R.I.B.A. (Archibald Dawnay) Trust Prizes, 1957. The R.I.B.A. (Archibald Dawnay) Trust Prizes for 1957 have been awarded as follows:—Prize of £100 to G. L. Bruce of the School of Architecture, Edinburgh College of Art; Prize of £100 to Thomas Henney of the School of Architecture, Edinburgh College of Art; Prize of £100 to I. R. Turner of the Nottingham School of Architecture; a renewal of the Prize of £60 awarded for the session 1956–57 to J. A. Dalton of the Architectural Association School of Architecture; a renewal of the Prize of £60 awarded for the session 1956–57 to Anthony Eardley, of the Architectural Association School of Architecture; and a renewal of the Prize of £60 awarded for the session 1956–57 to J. H. Williams of the Birmingham School of Architecture.

ALLIED SOCIETIES

Changes of Officers and Addresses

Cape Provincial Institute of Architects. The address of the Institute is now Natal Building Society Building, Greenmarket Square, Cape Town, South Africa.

Royal Architectural Institute of Canada. Hon. Secretary, Harland Steele, F.R.A.I.C. Secretary, Cyril J. G. Carroll, 88, Metcalfe Street, Ottawa 4, Ontario, Canada.

Alberta Association of Architects. Hon. Secretary, J. B. Bell. Executive Secretary, Mrs. H. L. Bond, 305, Northern Hardware Building, Edmonton, Alberta, Canada.

Manitoba Association of Architects. Change of address of President, Norman C. H. Russell, to 440, Stafford Street, Winnipeg 9, Manitoba, Canada.

Newfoundland Association of Architects. The position of Hon. Secretary-Treasurer is at present vacant.

Nova Scotia Association of Architects. Change of address of President, C. A. E. Fowler, to 28, South Street, Halifax, Nova Scotia, Canada.

Ontario Association of Architects. Change of address of President, E. C. S. Cox, to 4894, Dundas Street West, Toronto, Ontario, Canada.

Province of Quebec Association of Architects. Hon. Secretary, R. E. Bolton, F.R.A.I.C., 1980, Sherbrooke Street West, Montreal 25, P.Q., Canada. Executive Secretary, Jacques Tisseur, 620, Cathcart Street, Montreal, P.Q., Canada.

Saskatchewan Association of Architects. President, R. B. Ramsay, 2041, Hamilton

Street, Regina, Saskatchewan, Canada. Secretary-Treasurer, G. J. Berry, 1411, Albert Street, Regina, Saskatchewan, Canada.

Indian Institute of Architects. Joint Hon. Secretaries, J. P. J. Bilimoria [*F*] and A. S. Patil [*F*], Prospect Chambers Annexe, Hornby Road, Fort, Bombay, India.

GENERAL NOTES

Royal College of Art. Professor Steen Eiler Rasmussen [*H.C.M., Denmark*] has been appointed Lethaby Professor of Architecture for 1958 at the Royal College of Art in succession to Professor Basil Ward [*F*].

Institution of Structural Engineers. Mr. L. A. Chackett, F.R.I.C.S. [*F*], is giving a paper on 'The Relationship of the Architect and the Structural Engineer' at a meeting of the Institution at 11 Upper Belgrave Street, S.W.1, on Thursday 28 November at 6 p.m.

Members of the R.I.B.A. will be welcome to attend and take part in the discussion.

Leverhulme Research Awards. Fellowships and Grants, 1958. Application is invited for Fellowships and Grants in aid of research. These awards are intended for senior workers of established position and are limited to British-born subjects normally resident in the United Kingdom: in exceptional circumstances the Trustees may waive the condition as to residence.

No subject of inquiry is excluded from consideration but preference is given to subjects in which existing provision for research is inadequate.

The duration of the awards does not extend over more than two years or less than three months and the amount depends on the nature of the research and the circumstances of the applicant.

Application must be made on Form 'F' obtainable, together with further details, from the Secretary, Leverhulme Research Awards, St. Bridget's House, Bridewell Place, London, E.C.4 (CITy 1910).

The closing date is 31 December 1957. Results will be announced in May and the awards will normally date from 1 September 1958.

Notes from the Minutes of the Council

MEETING HELD ON 8 OCTOBER 1957

Appointment of R.I.B.A. Representatives

(*a*) *Court of the University of Bristol.* J. Ralph Edwards [*F*], in place of R. S. Redwood [*F*], whose term of office has expired. (*b*) *Court of the University of Hull.* Andrew Rankine [*A*] re-appointed. (*c*) *National Inspection Council for Electrical Installation Contracting.* R. N. Wakelin [*F*] as second R.I.B.A. representative on the Council. (*Note:* The other representative, already serving, is Thomas Mitchell [*A*].) (*d*) *Plumbing Trades National Apprenticeship Council.* E. M. Rice [*F*] re-appointed. (*e*) *Professional Classes Aid Council.* Mrs. A. H. Wolfe [*A*]. (*Note:* Digby Solomon [*F*], appointed by the Council at their meeting on 18 June, was unable to accept appointment.) (*f*) *Codes of Practice Committees and B.S.I. Committees:* (i) *Revision of Code CP, Chapter V—Loading.* D. W. Aldred [*F*]. (ii) *Glossary of General Building Terms.* D. W. Aldred [*F*] and F. H. Heaven [*A*]. (iii) *Drafting Committee on Timber Grading TIB*/1/1. George Newell [*A*]. (iv) *Code Drafting Committee on Lighting—ELCP*/8. John Reid [*A*]. (v) *Proposed Code of Practice on Weather Protection.* D. W. Aldred [*F*]. (vi) *Code of Practice C.P.* 301—*Building Drainage.* A. H. Ley [*F*]. (*g*) *R.I.B.A. Architecture Bronze Medals: R.I.B.A. Representatives to serve on Juries to consider Awards.* (i) *New South Wales Chapter, Royal Australian Institute of Architects.* F. W. Turner [*F*], Past President, New South Wales Chapter, R.A.I.A., in place of Professor H. Ingham Ashworth [*F*]. (ii) *Essex, Cambridge and Hertfordshire Society of Architects.* Basil Spence [*F*]. (iii) *Hampshire and Isle of Wight Architectural Association.* R. Duncan Scott [*F*].

Membership. The following members were elected: as Fellows 5; as Associates 57.

Students. 87 Probationers were elected as Students.

Applications for Election. Applications for election were approved as follows: *Election* 10 *December* 1957: as Fellows 2; as Associates 57. *Election* 4 *February* 1958 (*Overseas Candidates*): as Associates 25.

Applications for Reinstatement. The following applications were approved: as Licentiate: William Black; as Associates: Norman Alfred Peachey, Gordon Hugh Ream.

Resignations. The following resignations were accepted with regret: Hubert Joseph Benians [*F*], Mrs. Winifred Joyce Evans [*A*], Gilbert Fletcher [*L*], Keith Francis Jackson [*A*], Dudley Edward Vivian North [*A*], Robert Scott Skilling [*L*].

Applications for Transfer to Retired Members' Class under Bye-law 15. The following applications were approved: as Retired Fellows: Alfred Claude Burlingham, Thomas Arthur Lodge, George Edward Pepper, William Ronald Richardson, Leslie Stuart Stanley, Samuel Pointon Taylor; as Retired Associates: Lifford Claydon, Kenneth John Fisher; as Retired Licentiates: Harry Haycock, Harold Samuel Knopp, Thomas John Bertram Price.

Obituary. The Secretary reported with regret the death of the following members: Charles Marriott [*Hon. A*], Michel Roux-Spitz [*Hon. Corr. Member*], Richard Carter [*F*], Alfred Crampton [*F*], William James Donger [*F*], Bertram William Leonard Gallannaugh [*F*], George Albert Victor Hall [*F*], Harold Edward Moss [*F*], William Charles Symes [*F*], Lewis Edward Wade [*F*], William Murthwait How [*Retd. F*], Lieut.-Colonel George Oakley Scorer [*Retd. F*], John Byers [*A*], Joseph Fielden Dixon [*A*], John Edmund Farrell [*A*], William Victor Jenkins [*A*], Sydney W. Lucas [*A*], Nathaniel Frank Pearce [*A*], Stanley Highfield Penlington [*A*], Clement Lawrence Pope [*A*], Albert Isaac Turner [*Retd. A*], Alfred Myddleton Cock [*L*], Aubert Thomas Doe [*L*], George Duns [*L*], John Heamans Johns [*L*], John McIntyre [*L*], Charles Henry Hughes Oldham [*L*], Thomas Fort Parker [*L*], James Robert Veethavanam [*L*], William Henry Dark [*Retd. L*], Gordon Arthur Joslin [*Retd. L*], Charles Henry Riley [*Retd. L*], Sir George Edward Stott, Bt. [*Retd. L*], Alan Neil Cathcart [*Subscriber*].

By resolution of the Council the sympathy and condolences of the Royal Institute have been conveyed to their relatives.

Obituaries

Andrew Edward Angus [*A*] died on 21 January 1956, aged 61.

Mr. Angus received his training at the Robert Gordon's College, Aberdeen, and with Mr. George Sutherland [*A*] in the same town. He started private practice in 1924 in Port Arthur, Ontario, Canada. He had a general practice which included municipal and provincial government buildings, and commercial, recreational and residential works. Messrs. Lynden Y. McIntosh and Associates are continuing the practice.

Albert Victor Cotton [*L*] died on 20 March 1957, aged 65.

Mr. Cotton was educated at the Wedgewood Institute and the School of Art, Burslem, and was articled to his elder brother, Mr. Arthur Cotton, Architect and Surveyor to the Borough of Newcastle under Lyme. He started private practice in 1919, joining his father in partnership at Stoke-on-Trent. Successive partnerships were formed with Mr. F. V. Hulme [*L*] in 1925, Mr. C. J. Richards in 1946 and Mr. P. T. Smith [*L*] in 1954, and finally Mr. R. A. Mason [*A*], who is continuing the practice of A. Cotton, Son and Mason.

Mr. Cotton's principal work included the new front to the Theatre Royal, Hanley; four cinemas in Stoke-on-Trent; hotels, public houses and shops and extensive housing development in and around Stoke-on-Trent and Newcastle under Lyme, in addition to sundry work for Rolls-Royce Ltd.

Mr. Cotton had also been a lecturer on building construction and quantity surveying at the Wedgewood Institute, Burslem.

Peter Cummings [*F*] died on 8 June 1957, aged 78.

Mr. Eric Levy [*F*] writes:

'Mr. Cummings received his architectural training in the office of an ecclesiastical architect in Cardiff. He commenced practice in Manchester soon after the end of the First World War.

'During the period between the wars, Mr. Cummings gained a reputation for cinema work and was responsible for many cinemas in and around Manchester, including the Capitol Cinema, Didsbury, the Apollo Cinema, Ardwick, and the Tatler News Theatre, Oxford Street, Manchester. His other works include the Appleby Lodge Flats, Rusholme, Manchester, in conjunction with Messrs. Gunton and Gunton, and several synagogues, his most recent work being the new synagogue in Jacksons Row, Manchester, in which I had the honour to be associated with him.

'He will be sadly missed by many friends both inside and outside the profession.'

Henry Norman Edwards [*Retd. F*] died on 27 March 1957, aged 72.

Mr. Edwards served his articles with Messrs. H. Teather and C. Wilson [*FF*] of Cardiff. In 1920 he entered into partnership with Mr. C. F. Jones [*A*] in the same city, finally starting practice on his own account in 1936. In 1941 he was appointed Deputy Technical Adviser to the War Damage Commission for Wales, until a breakdown in health forced him to retire in 1950.

His work was mainly domestic and included local country houses and housing schemes, and also Glamorgan Buildings, and Albany Road Baptist Church, Cardiff.

Mr. Edwards was a past Chairman of the Central (Cardiff) Branch of the South Wales Institute of Architects and had represented that Branch on the Allied Societies' Conference.

John Gillespie [*L*] died on 25 March 1957, aged 59.

Mr. Gillespie received his training under Dr. McGregor Chalmers and the Royal Technical College, Glasgow, and the Glasgow School of Art. He entered the service of Greenock Corporation in 1928 and was later appointed Principal Architectural Assistant, which position he held until his death.

He was responsible for the design of many buildings in Greenock, including the first women's hostel at Westburn Square and the South-West Library, and major housing developments at Gibbshill, South Maukinhill, Auchmead and Braeside.

Mr. Gillespie had a wide knowledge of Scottish history and his services as a lecturer were in much demand. He also contributed verse to various periodicals, including the poetry magazine, COUNTRY BARD of America, and his booklet, *This Heatherland*, was sold in aid of the Greenock Spitfire Fund during the last war.

He was a Fellow of the Royal Incorporation of Architects in Scotland, of the Society of Antiquaries in Scotland and of the Royal Society of Arts.

William Herbert Hobday [*F*] died on 27 March 1957, aged 80.

Mr. Hobday was a partner in the firm of Paine and Hobday from 1927 until 1947 when he entered into partnership with Mr. F. J. Maynard [*F*] as Hobday and Maynard. Mr. Hobday retired in 1954 and Mr. Maynard is continuing the practice.

Mr. Hobday was chiefly concerned with hospital, school and ecclesiastical work. His more important hospital work included Queen Mary's Hospital for Children, Carshalton; Redhill Hospital, Edgware; Beckenham Maternity Home; emergency hospitals for the Ministry of Works at Hitchin and Hemel Hempstead; Lancing College Sanatorium and Eton College Sanatorium; and the Winifred House Children's Convalescent Home, Barnet. School work included war damage repairs and improvements to Wilton Way School, London, E.8, the reconstruction of Erith Belmont Primary School, Kent, and of Chislehurst County Grammar School, and extensions to Beckenham County School for Girls; and amongst his church work were extensions and the reconstruction of St. Barnabas Church and also St. Barnabas Mission Church at Beckenham, the restoration of Farnborough Church, Kent; Gravesend Memorial Chapel, and most recently the new Church of St. Michael's and All Angels, Beckenham.

Louis Jacob [*Retd. F*] died on 27 January 1957, aged 88.

Mr. Jacob was the son of Mr. Benjamin Jacob, first Mayor of Deptford. He was educated at Haberdashers' Aske's Hatcham Boys' School and a boarding school at Ramsgate, and was articled to Mr. H. C. Boyes [*F*].

Mr. Jacob specialised in quantity surveying. He did much work for the old Boards of Guardians and Metropolitan Asylums Boards before they were vested in local authorities, and he was responsible for Roan School for Boys, and extensions to Roan School for Girls, Greenwich; and a Nurses' Home at Vanbrugh Hill, Blackheath.

He was a Senior Past-Master of the Carpenters' Company which he represented on a number of Examination Boards. In this connection in 1937 he was presented with a specially bound copy of the 14th Volume, compiled by the Wren Society, by the Incorporated Clerks of Works Association of Great Britain 'as a token of their appreciation and thanks for his assistance in establishing their examinations'.

He was also Fellow of the Royal Institution of Chartered Surveyors and one of the three oldest members of the Architectural Association, and he was a former Vice-President of the British Institute of Certified Carpenters, and a Director of the People's Building Society, Deptford Broadway, for 45 years.

Mr. Berry Webber [*F*] is continuing the practice.

John Merton Jones [*L*] died on 11 February 1957, aged 74.

Mr. Jones served his articles with Mr. E. A. Johnson [*F*] of Abergavenny, Mon., subsequently entering into partnership with him and his partner, Mr. E. W. Richards. After their deaths during the First World War, he became sole partner. Mr. J. T. Richards [*A*] is continuing the practice, now under the style of Merton Jones and Richards.

His principal architectural works include extensions to Blaina and Abergavenny Hospitals, Llanhilleth Church (as assistant to Mr. Johnson) and local private housing and work for the local authority.

Mr. Jones had a distinguished military career in the First World War, serving with the 3rd Monmouthshire Regiment and the Royal Engineers, being decorated with the French Croix de Guerre avec Palmes and twice mentioned in dispatches. He was a member of the South Wales Institute of Architects; and also a keen amateur painter in oils and water colours.

Membership Lists

ELECTION: 8 OCTOBER 1957

The following candidates for membership were elected on 8 October 1957.

AS FELLOWS (5)

Berbiers: John Louis, Dipl.Arch.(L'pool), Dip.T.P.(Manchester), A.M.T.P.I. [*A* 1945], Canterbury.
Gibson: Donald Evelyn Edward, C.B.E., M.A. (Manchester), M.T.P.I. [*A* 1932], Nottingham.
Marshall: Alexander Theodore, D.A., Dip.T.P. (Edin.), A.M.P.T.I. [*A* 1939], Londonderry.
Ritchie: John Archibald, A.A.Dipl. [*A* 1930], Rome, Italy.
Smith: Kenneth Reginald, A.A.Dipl. [*A* 1935].

AS ASSOCIATES (57)

Alexander: Thomas William, D.A.(Edin.), Lothianburn.
Anderson: Thomas Russell, A.R.I.C.S., Cowbridge.
Artur: Andrzej.
Beaumont: James Charles, Dip.Arch.(Birm.), Leamington Spa.
Bottoms: David Julius, A.A.Dipl., St. Peters-in-Thanet.
Bradley: Guy William.
Bretnall: Athol William, Brisbane, Australia.
Burnett: (Miss) Rosanna Mary, Farnham.
Butler: Anthony Brian, Dipl.Arch.(Northern Polytechnic), Toronto, Canada.
Clare: Keith Antony Woolley, Salisbury, Southern Rhodesia.
Crockett: Eric Edward Charles, Pietermaritzburg, S. Africa.
Day: (Miss) Paquita, B.Arch.(Queensland).
Diprose: Alan, A.A.Dipl.
Dixon: Roy Rex.
Dobby: Harry, Aden Colony, S. Arabia.
Drake: Henry, Haslingden.
Duffield: Peter, Dipl.Arch.(The Polytechnic), Elizabeth South, South Australia.
Earles: Noel Leadman, Dip.Arch.(Auck., N.Z.), Hamilton, New Zealand.
Eccles: Henry W., Dip. Arch.(Manchester), Preston.
Ellmers: Jack William, Clacton-on-Sea.
Fisher: Geoffrey John, Newcastle upon Tyne.
Forbes: Brian Keenan, Dip.Arch.(Sheffield).
Gibberd: Graham Roope, A.A.Dipl.
Grindall: Andrew Maxwell, D.A.(Edin.), Dumfries.
Hemingway: George Douglas, Dipl.Arch. (Leeds), Richmond, Surrey.
Hewetson: William Dickson, Leicester.
Hislop: Patrick John, B.A.(Arch.) (Manchester).
Ho: Yut Choon, B.Arch. (Catholic University of America).
Holtzhausen: Derek Michael, B.Arch.(C.T.), Wynberg, S. Africa.
Jellema: Willem Hugo, Belfast.
Jordan: Robert Victor.
Kent: Janusz Seweryn, Bromley.
Kirkham: Peter James, Stoke-on-Trent.
Lewandowski: Witold Julian.
Lovegrove: Ralph Liddell, A.A.Dipl., Shortlands.
McIntosh: Colin James, B.Arch.(L'pool), Hertford.
Maclean: Gordon Hector, B.Arch.(Rand).
Martin: James Maclean, Dipl.Arch.(Leeds), Colne.
Mason: George Rex, Auckland, New Zealand.
Meeking: Brian David.
Moughtin: James Clifford, M.C.D., B.Arch. (L'pool), Liverpool.
Page: Anthony Matthews, Dipl.Arch.(Northern Polytechnic).
Park: Allan Thomas, Sanderstead.
Payne: (Miss) Janet Evelyn Churchill, Dipl. Arch.(Northern Polytechnic), Bournemouth.
Powell: Owen Edmund, B.Arch.(C.T.), Salisbury, Southern Rhodesia.
Pratt: Robert, Maidenhead.
Pritchard: Dudley Ross, B.Arch.(Sydney), Sydney, Australia.
Reid: George, D.A.(Edin.), Port Seton.
Serjeant: Denis Lee Talbot, Oxford.
Silcock: David Donald Joseph, B.Arch.(L'pool), Wirral.
Soanes: Bryan Horace, Oxford.
Speirs: Cunningham Alexander, Dip.Arch. (Birm.), Birmingham.
Town: Kenneth Richard, Edinburgh.
Watrach: Kazimierz Wladislaw.
Willder: Peter Sims, Belper.
Young: Hugh Alexander, Sutton Coldfield.
Zadziuk: Mieczyslaw Karol, Leeds.

ELECTION: 10 DECEMBER 1957

An election of candidates for membership will take place on 10 December 1957. The names and addresses of the candidates, with the names of their proposers, are herewith published for the information of members. Notice of any objection or any other communication respecting them must be sent to the Secretary, R.I.B.A., not later than Saturday 16 November 1957.

The names following the applicant's address are those of his proposers.

AS FELLOWS (2)

The following Licentiates have passed the qualifying examination:—

Daviel: John René Francis, Messrs. Clayton, Black and Daviel, 10 Prince Albert Street, Brighton; White Lodge, Bolney, Sussex. K. E. Black, F. F. Howard, J. L. Denman.

Tyndall: Donald Alfred, 43 Fitzwilliam Place, Dublin; 'Sorrentoville', Vico Road, Dalkey, Co. Dublin. J. J. Robinson, G. A. Jellicoe, Vincent Kelly.

AS ASSOCIATES (57)

The name of a school, or schools, after a candidate's name indicates the passing of a recognised course.

Aitken: Philip, D.A.(Dundee) (Dundee Coll. of Art: Sch. of Arch.), 28 Tiree Place, Kirkcaldy, Fife. John Needham, W. S. Gauldie, L. A. Rolland.

Alcroft: Keith Edwin, Dip.Arch.(Sheffield), (Univ. of Sheffield: Dept. of Arch.), 1 Abbeydale Park Crescent, Totley Rise, Sheffield. Prof. Stephen Welsh, H. B. S. Gibbs, H. B. Leighton.

Attree: Arthur Arnald, Dip.Arch.(Manchester) (Victoria Univ. Manchester: Sch. of Arch.), 7 Wolseley Place, Withington, Manchester, 20. Prof. R. A. Cordingley, Dr. W. A. Singleton, Prof. Clifford Holliday.

Bain: Donald William, Dip.Arch.(Abdn.) (Aberdeen Sch. of Arch: Robert Gordon's Tech. Coll.), c/o Northern Ireland Housing Trust, 12 Hope Street, Belfast, N. Ireland. E. F. Davies, R. H. Gibson, E. D. Taylor.

Bellears: Edwin, (Final) Castle Mill, Linby, Notts. Cecil Howitt, C. St. C. Oakes, F. E. Woolley.

Billington: George Alan, B.Arch.(L'pool) (Liverpool Sch. of Arch.: Univ. of Liverpool), The Hollies, 20 Lawton Road, Rainhill, Lancashire. Prof. R. Gardner-Medwin, R. R. Young, Miss J. E. Townsend.

Bishop: John Michael Venables, D.A.(Edin.) (Edinburgh Coll. of Art: Sch. of Arch.), 57 Beveridge Street, Brucefield, Dunfermline. J. R. McKay, W. H. Kininmonth, T. W. Marwick.

Boyer: Ernest Stanley, (Final), 'Badgers Mount', Dunny Lane, Chipperfield, Hertfordshire. M. Barnett, S. Stern, Thomas Bilbow.

Brimilcombe: Geoffrey Ernest, D.A.(Edin.) (Edinburgh Coll. of Art: Sch. of Arch.), 42 Churchill Road, Castlandhill, Rosyth, Fife, Scotland. J. R. McKay, T. W. Marwick, W. H. Kininmonth.

Brown: Alan William John, D.A.(Edin.) (Edinburgh Coll. of Art: Sch. of Arch.), 4 Learmonth Crescent, Edinburgh. R. F. Hutchison, Prof. R. H. Matthew, Esme Gordon.

Buchanan: Edward Redpath, D.A.(Edin.) (Edinburgh Coll. of Art: Sch. of Arch.), 59 Greig Crescent, Armadale, West Lothian. W. H. Kininmonth, Prof. R. H. Matthew, J. R. McKay.

Burnett: Alan William Graham, D.A.(Edin.) (Edinburgh Coll. of Art: Sch. of Arch.), 64 Broomhouse Street South, Edinburgh, 11. W. G. Dey, W. H. Kininmonth, Esme Gordon.

Chadwick: Herbert Leslie Hulme, A.R.C.A., (Special Final), 26 Eccleston Street, S.W.1. Michael Tapper, F. R. S. Yorke, Basil Spence.

Chipkin: Clive Michael, B.Arch.(Rand.) (Passed a qualifying Exam. approved by the I.S.A.A.), c/o Mrs. Rimmer, 51 Overstrand Mansions, Prince of Wales Drive, S.W.11. Applying for nomination by the Council under Bye-law 3(d).

Chitty: John George, A.A.Dipl. (Arch. Assoc. (London): Sch. of Arch.), 167 Yorkland Avenue, Welling, Kent. Arthur Korn, M. Pattrick, A Beasley.

Croll: Norman Hugh, Dip.Arch. (Abdn.) (Aberdeen Sch. of Arch.: Robert Gordon's Tech. Coll.), 154 High Street, Brentwood, Essex. E. F. Davies, John Maclennan, D. J. A. Ross.

Crossan: Gerald Mulholland, D.A.(Dundee) (Dundee Coll. of Art: Sch. of Arch.), 8 Monifieth Road, Broughty Ferry, Dundee, Angus. John Needham, T. H. Thoms, H. M. Smail.

Czeiler: (Miss) Yvonne Jeannine, B.Arch. (Dunelm) (King's Coll. (Univ. of Durham), Newcastle upon Tyne: Sch. of Arch.), 36 Rectory Road, Gosforth, Newcastle upon Tyne, 3. Prof. W. B. Edwards, J. H. Napper, F. Fielden.

Dines: Kenneth George, (Final), c/o County Architect's Department, County Buildings, Huntingdon. T. E. Scott, C. G. Bath, T. H. Longstaff.

Ferguson: Ian Alexander, Dip.Arch.(Abdn.) (Aberdeen Sch. of Arch.: Robert Gordon's Tech. Coll.), 56 Forest Avenue, Aberdeen. E. F. Davies, John Maclennan, J. G. Marr.

Gibberd: John Vernon, Dip.Arch.(The Polytechnic) (The Poly., Regent Street, London: Sch. of Arch.), 13 Loom Lane, Radlett, Herts. J. S. Walkden, Denis Clarke Hall, J. S. Foster.

Gill: Michael, D.A.(Edin.) (Edinburgh Coll. of Art: Sch. of Arch.), 71 Alexander Road, Rosyth, Fife, Scotland. James Shearer, Donald Jack, A. C. S. Auld.

Grom: Peter Paul, (Special Final), Hebburn U.D.C., Argyle Street, Hebburn, Co. Durham. Applying for nomination by the Council under Bye-law 3(d).

Gunzburg: (Mrs.) Anna Luise, (Special Final), 49 Prospect Road, Moseley, Birmingham, 13. D. A. Goldfinch, H. L. Hare, E. Holman.

Hall: Ian White, D.A.(Edin.) (Edinburgh Coll. of Art: Sch. of Arch.), 2 Wardie Road, Edinburgh, 5. James Johnston, J. R. McKay, W. G. Dey.

Hancock: Thomas Reeves, Dip.Arch.(Leics.) (Leicester Coll. of Art and Tech.: Sch. of Arch.), 1 St. Martins, Leicester. F. Chippindale, S. S. Moore, G. A. Cope.

Hawkes: John Edwards Yerrow, Dip.Arch. (Leics.) (Leicester Coll. of Art and Tech.: Sch. of Arch.), 19 Woodland Avenue, Leicester. F. Chippindale, S. S. Moore, G. A. Cope.

Herbert: Hugh Grahame, A.A.Dipl. (Arch. Assoc.(London): Sch. of Arch.), Barclays Bank House, Hatch End, Middlesex. A. W. Cox, Leo De Syllas, M. H. Cooke-Yarborough.

Jackson: George Edward, (Special Final), 'Rosslyn', 3 Silver Birch Way, Lydiate, Near Liverpool. Applying for nomination by the Council under Bye-law 3(d).

James: Frederick Cottrell, (Special Final), 1 Stelvio Park Avenue, Newport, Mon. Johnson Blackett, L. R. Gower, C. F. Bates.

Kennedy: George Raphael Michael, D.A. (Edin.) (Edinburgh Coll. of Art: Sch. of Arch.), 'Launceston', 125 Rickerscote Road, Stafford. Prof. R. H. Matthew and applying for nomination by the Council under Bye-law 3(d).

Kirkland: Allan Wilberforce, D.A.(Edin.) (Edinburgh Coll. of Art: Sch. of Arch.), 64 Arden Street, Edinburgh, 9. W. G. Dey, W. A. P. Jack, Esme Gordon.

Kolek: Zygmunt Edward, (Final), 41 Comyn Road, S.W.11. E. D. Mills, R. M. Pigott and applying for nomination by the Council under Bye-law 3(d).

Lunnon: Peter John, Dipl.Arch.(Northern Polytechnic) (Northern Poly.(London): Dept. of Arch.), 141 Danson Road, Bexley, Kent. T. E. Scott, C. G. Bath, S. F. Burley.

McInnes: Donald, D.A.(Edin.) (Edinburgh Coll. of Art: Sch. of Arch.), 20 Selkirk Street, Markinch, Fife. Prof. R. H. Matthew, Esme Gordon, W. G. Dey.

Mazuch: Bronislaw, (Special Final), 145 Elm Crescent, S.W.4. A. C. Hopkinson, R. T. Boutall, Z. Sirotkin.

Moiret: Peter Paul, (Special Final), 21 Willifield Way, N.W.11. Leslie Wood, Robert Cromie, R. T. Green.

Nowak: Zygmunt Julian, (Special Final), 92 Chevening Road, N.W.6. H. E. Foreman and applying for nomination by the Council under Bye-law 3(d).

Oliver: George Lawson, D.A.(Edin.) (Edinburgh Coll. of Art: Sch. of Arch.), 45 High Street, Jedburgh, Roxburghshire. David Carr, W. G. Dey, J. R. McKee.

O'Neill: Cathal Michael, B.Arch. (N.U.I. Dublin) (Univ. Coll. Dublin: Ireland: Sch. of Arch.), 453 Griffith Avenue, Glasnevin, Dublin. W. A. Maguire, Vincent Kelly, J. V. Downes.

Paterson: John Lamb, D.A.(Edin.) (Edinburgh Coll. of Art: Sch. of Arch.), 41 Comely Bank Road, Edinburgh. Prof. R. H. Matthew, R. F. Hutchison, Esme Gordon.

Piet: Zbigniew Jan, (Special Final), 94 Princes Avenue, W.3. Bryan Westwood, N. C. Westwood and applying for nomination by the Council under Bye-law 3(d).

Prior: (Miss) Evelyn Martha, (Special Final), 30, Addison Way, Hampstead Garden Suburb, N.W.11. Norman Keep, Edwin Williams, C. W. Box.

Prisgrove: Rodney Bryan, (Final), 115 Merton Hall Road, Merton Park, S.W.19. J. K. Hicks, F. J. Lander, Cedric Ripley.

Ramage: John Lowrie, D.A.(Edin.) (Edinburgh Coll. of Art: Sch. of Arch.), Collingwood, Melrose, Roxburghshire. Esme Gordon, W. G. Dey, R. F. Hutchison.

Scrutton: Frederick Alma, D.A.(Edin.) (Edinburgh Coll. of Art: Sch. of Arch.), 114 Viewforth, Edinburgh, 10, Prof. R. H. Matthew, Esme Gordon, W. G. Dey.

Shaw: Denis, (Final), 'Castle Mill', Linby, Notts. Cecil Howitt, C. St. C. Oakes, F. E. Woolley.

Stepan: Olgierd Michal, (Special Final), 40 Stillness Road, S.E.23. M. H. Forward, A. G. Sheppard Fidler, L. C. Howitt.

Stevens: Brian Joseph, (Final), 122 Feckenham Road, Redditch, Worcestershire. A. Douglas Jones, G. C. Gadd, F. R. Hill.

Sutton: Rodney Hale, Dipl.Arch. (Northern Polytechnic) (Northern Poly. (London): Dept. of Arch.), 56 Woodland Way, Winchmore Hill, N.21. E. D. Mills, S. F. Burley, T. E. Scott.

Toplis: Ian Leslie, Dipl.Arch. (Northern Polytechnic) (Northern Poly.(London): Dept. of Arch.), Cairn Gorm, Lappetts Lane, South Heath, Gt. Missenden, Bucks. T. E. Scott, Harold Greenwood, W. S. Hattrell.

Tuckley: Allan, Dip.Arch.(Manchester) (Victoria Univ. Manchester: Sch. of Arch.), 'The Lilies', Windley, Nr. Derby. Prof. R. A. Cordingley, Dr. Thomas Howarth, F. H. Crossley.

Valentine: Charles Allan, D.A.(Edin.) (Edinburgh Coll. of Art: Sch. of Arch.), Jeanie Bank, Kenilworth Road, Bridge of Allan, Stirlingshire, Scotland. Prof. R. H. Matthew, G. B. Biggar, Frederick Gibberd.

van Breda: Brian Hendrick, B.Arch.(C.T.) (Passed a qualifying Exam. approved by the I.S.A.A.), 20 St. Barnabas Road, Woodford Green, Essex. Prof. L. W. T. White, F. L. Sturrock, O. Pryce Lewis.

White: Thomas, D.A.(Edin.) (Edinburgh Coll. of Art: Sch. of Arch.), 11 Lauriston Place, Edinburgh, 3. W. H. Kininmonth, Esme Gordon, Prof. R. H. Matthew.

Wilson: Charles Jeremy, D.A.(Edin.) (Edinburgh Coll. of Art: Sch. of Arch.), Princeland, Coupar-Angus, Perthshire. J. R. McKay, T. W. Marwick, W. H. Kininmonth.

Winter: Roy William, Dip.Arch.(Birm.) (Birmingham Sch. of Arch.). 645 Shirley Road, Hall Green, Birmingham, 28. A. Douglas Jones, G. A. G. Miller, Herbert Jackson.

ELECTION 4 FEBRUARY 1958

An election of candidates for membership will take place on 4 February 1958. The names and addresses of the overseas candidates, with the names of their proposers, are herewith published for the information of members. Notice of any objection or any other communication respecting them must be sent to the Secretary, R.I.B.A., not later than Wednesday 29 January 1958.

The names following the applicant's address are those of his proposers.

AS ASSOCIATES (25)

The names of a school, or schools, after a candidate's name indicates the passing of a recognised course.

Chew: Chin Aik Victor, B.A.(Cantab.) Dip. Arch.(The Polytechnic) (The Poly. Regent Street, London: Sch. of Arch.), c/o E. J. Seow Esq., 45 Bank of China Building, Singapore, 1. Malaya. C. Y. Koh, K. S. Ng, K. A. Brundle.

Dutcher: Norman Gerald, B.Arch.(Manitoba) (Univ. of Manitoba, Winnipeg, Canada: Dept. of Arch.) G.R.30, R.R. No. 1, Ste. Genevieve, Quebec, Canada. J. M. Venters, and the President and Hon. Secretary of the P.Q.A.A. under Bye-law 3(a).

Ellison: Donald John, B.Arch.(Auck. N.Z.) (Passed a qualifying Exam. approved by the N.Z.I.A.), 29 13th Avenue, Tauranga, North Island, New Zealand. Prof. C. R. Knight, Prof. A. C. Light, and the President and Hon. Secretary of the N.Z.I.A. under Bye-law 3(a).

Farley: William Raymond, B.Arch.(Sydney) (Passed a qualifying Exam. approved by the R.A.I.A.), 'Coolabah,' Box 16 P.O., Yenda, N.S.W., Australia. Prof. H. I. Ashworth, Prof. Leslie Wilkinson, P. J. Gordon.

Gotlieb: Marcus Theodore, B.Arch.(Auck. N.Z.) (Passed a qualifying Exam. approved by the N.Z.I.A.), 1 Athol Crescent, Wellington, New Zealand. Prof. C. R. Knight, Prof A. C. Light and the President and Hon. Secretary of the N.Z.I.A. under Bye-law 3(a).

Hall: Frank Scrivener, B.Arch.(L'pool) (Liverpool Sch. of Arch: Univ. of Liverpool) Apt. 406, Block 4, 500 Mountain Park Avenue, Hamilton, Ontario, Canada. B. A. Miller, R. R. Young, Herbert Thearle.

Jeevanayagam: Alagasundaram Kingsbury, Dip. Arch.(Melbourne) (Passed a qualifying Exam. approved by the R.A.I.A.), 2 De Saram Road, Mt. Lavania, Ceylon, Harry Winbush, Prof. B. B. Lewis, R. G. Parker.

Kofoed: Albert Graham, B.Arch.(Auck.N.Z.) (Passed a qualifying Exam. approved by the N.Z.I.A.), Dominion Building, Mercer Street, Wellington, New Zealand. Prof. C. R. Knight, J. I. King, W. G. Young.

La Gro: Jens Wybrand, (Passed a qualifying Exam. approved by the N.Z.I.A.), 25 London Street, Ponsonby, Auckland, New Zealand. C. R. Ford. W. H. Gummer, Prof. C. R. Knight.

Lee: Sian Teck, B.Arch.(Sydney) (Passed a qualifying Exam. approved by the R.A.I.A.), 2 Recreation Road, Singapore, 19, Malaya. Prof. H. I. Ashworth, Prof. Denis Winston, Cobden Parkes.

Lim: Kooi Chang, B.Arch.(Sydney) (Passed a qualifying Exam. approved by the R.A.I.A.), 280 Beach Street, Penang, Malaya. Prof. H. I. Ashworth, Prof. Denis Winston, Cobden Parkes.

Lim: (Mrs.) Theresa Mun Sim, B.Arch. (Sydney) (Passed a qualifying Exam. approved by the R.A.I.A.), 82 Branksome Road, Katong, Singapore, 15, Malaya. Prof. H. I. Ashworth, Prof. Denis Winston, E. L. Thompson.

Murray: George Percival Ross, D.A.(Edin.) (Edinburgh Coll. of Art: Sch. of Arch.), c/o Messrs. Miller, White & Dunn, P.O. Box, 392, Dunedin, New Zealand. Esme Gordon, W. G. Dey, Prof. R. H. Matthew.

Pennington: Richard Peter Gibbs, Dip.Arch. (Manchester) (Victoria Univ. Manchester: Sch. of Arch.), Apt, 306, Riviera Court, Mimico, Ontario, Canada. W. L. Somerville, Prof. R. A. Cordingley, Dr. W. A. Singleton.

Robinson: John Cecil, (Special Final) c/o P.W.D., Jesselton, North Borneo. H. L. Bloomfield and applying for nomination by the Council under Bye-law 3(d).

Samson: James Workman, M.C., (Special Final) c/o Messrs. Rinaldi, Macdonald and Harvey, 318 Tanganyika House, Salisbury, Southern Rhodesia. W. F. Hendry, R. C. Rinaldi, C. A. Knight.

Sheldon: Stephen, (Final), 60 Porterfield Road, Rexdale, Toronto, Canada. Applying for nomination by the Council under Bye-law 3(d).

Si Hoe: Kok Sing, B.Arch.(Auck.N.Z.) (Passed a qualifying Exam. approved by the N.Z.I.A.), 12–C Amber Road, Singapore, 15, Malaya. Prof. C. R. Knight, Prof. A. C. Light and the President and Hon. Secretary of the N.Z.I.A. under Bye-law 3(a).

Simmons: Eric Bernard, (Passed a qualifying Exam. approved by the N.Z.I.A.), Structon Group Architects, Box 310, Wellington, New Zealand. D. W. Aldred, E. W. Palmer, K. J. V. Watson.

Skinner: David Neave, B.Arch.(L'pool) (Liverpool Sch. of Arch: Univ. of Liverpool), 8864 Towanda Street, Chestnut Hill, Philadelphia, Pennsylvania, U.S.A. Prof. R. Gardner-Medwin, B. A. Miller, Prof. H. M. Wright.

Stander: Konstantyn, B.A.(Arch.)(C.T.) (Passed a qualifying Exam. approved by the I.S.A.A.), 908 Dumbarton House, Church Street, Cape Town, S. Africa. Prof. L. W. T. White and applying for nomination by the Council under Bye-law 3 (d).

Stegmann: Andrew Murray, B.Arch.(Rand) (Passed a qualifying Exam. approved by the I.S.A.A.), 52 Aberdeen Road, Avondale, Salisbury, Southern Rhodesia. W. F. Hendry, C. A. Knight, W. D. Cathcart.

Teh: Cheang Wan, B.Arch.(Sydney) (Passed a qualifying Exam. approved by the R.A.I.A.), 20 Barrack Road, Penang, Malaya. Prof. H. I. Ashworth, Prof. Denis Winston, Cobden Parkes.

Thurai Rajah: Velupillai Suppiah, A.A.Dipl. (Arch.Assoc.(London): Sch. of Arch.), 39 Vivekananda Road, Colombo, 6, Ceylon. T. N. Wynne-Jones, H. E. Gonsal, G. B. Altham.

Wong: Wai Ying, B.Arch.(Sydney) (Passed a qualifying Exam. approved by the R.A.I.A.), 19 Bukit Pasoh Road, Singapore, 2, Malaya. Prof. F. E. Towndrow, Prof. Denis Winston, W. R. Laurie.

Members' Column

This column is reserved for notices of changes of address, partnership and partnerships vacant or wanted, practices for sale or wanted, office accommodation, and personal notices other than of posts wanted as salaried assistants for which the Institute's Employment Register is maintained.

APPOINTMENTS

Mr. A. W. Cleeve Barr [*A*] has resigned his position as Assistant Housing Architect to the L.C.C. in order to take up the appointment of Principal Development Architect, Ministry of Education, Curzon Street, W.1.

Mr. Norman Brown [*A*] has taken up the appointment of Surveyor at the Royal Ordnance Factory, Pembrey, Carmarthenshire, where he will be pleased to receive trade catalogues.

Mr. M. E. Campin [*A*] is leaving the employment of the Oxfordshire County Council in December to take up an appointment in the Architectural Division of the New Zealand Ministry of Works.

Mr. Arthur D. Craven [*L*] has been appointed Senior Metropolitan Architect to the South Australian Housing Trust. His address remains Paringa Building, 13 Hindley Street, Adelaide, S.A., where he will be pleased to receive technical and trade literature.

Mr. Eric Defty [*A*] has accepted a visiting professorship to the University of Utah, and his address is now c/o Department of City Planning, University of Utah, Logan, Utah, U.S.A.

Mr. Charles Dewar Hay [*A*] has been appointed Chief Architect to the Public Works Department, Georgetown, British Guiana, South Africa, where he will be pleased to receive technical and trade literature.

Mr. Bernard Matthews, F.R.I.C.S., M.T.P.I. [*F*], was elected President of the Institution of Surveyors of India at the Annual Meeting recently held in Delhi.

Mr. Maurice S. Methven, A.M.T.P.I. [*A*], has retired from his appointment as architect, planner and landscape architect with the Canadian Federal Government, and has joined Candeub and Associates, city planning and urban renewal consultants of Newark, New Jersey, as their Director of Planning in Puerto Rico and Director of Physical Planning.

Mr. E. S. Wright [*A*] has been appointed City Architect of the City of Townsville, and his address is now c/o the Town Hall, City of Townsville, Queensland, Australia.

PRACTICES AND PARTNERSHIPS

Mr. Roy Hope [*A*], at the conclusion of his contractual partnership with the firm of **Messrs. Williams, Pettett and Hope** [*F*/*A*], of 58 High Street, Epsom, is now, until further notice, practising in his own name from 2 Cadogan Place, London, S.W.1 (BELgravia 3263), where he will be pleased to receive trade catalogues, etc.

Following the death of their partner, **Mr. Harold E. Moss** [*F*], and the retirement of **Mr. H. S. Grafton Bedells,** F.R.I.C.S., **Messrs. Lander, Bedells and Crompton** are continuing the practice under the same title, the partners being **Mr. Ian Fraser** [*A*] and **Mr. Eric Claxton,** F.R.I.C.S. A branch office has been opened at 44 Kennedy Street, Manchester, under the direction of **Mr. Arthur P. Holt** [*A*].

Mr. Robert F. Mitchell [*A*] has been taken into partnership by **Mr. B. N. Girdlestone.** The firm will practise under the title of **Girdlestone and Mitchell,** at Winslow Chambers, High Street, Lower Hutt, New Zealand.

Mr. Herbert Morel [*A*] has dissolved his partnership with **Mr. R. Mountford Pigott** [*F*] and **Mr. Michael Pigott** [*A*], by mutual consent, and has opened an office at 18 Sackville Street, London, W.1 (REGent 5580), where he will be pleased to receive manufacturers' literature.

Mr. Colin Rowntree [*F*] has taken **Mr. Richard D. Swallow** [*A*] and **Mr. George A. Wood** into partnership, and will continue to practise under the name of **Colin Rowntree and Partners** at 120, The Mount, York.

Mr. A. Lloyd Spencer [*F*], until recently Assistant Director Public Works (Buildings) to the Northern Rhodesia Government on secondment from the Ministry of Works, has resigned and entered into an association with **Messrs. Huckle and Durkin** of 30 Queen Anne Street, London, W.1, and has opened a practice at 604 Pockets Building, 30 Stanley Avenue, Salisbury, S. Rhodesia, under the style of **A. Lloyd Spencer and Partners,** where he will be pleased to receive trade catalogues.

Mr. Paul Swain [*F*] has taken **Mr. Warwick Vaughan Jelley** [*A*] into partnership under the style of **Queree, Swain and Jelley.** The practice will continue at Les Bois, St. Peter, Jersey, Channel Islands.

Mr. R. Paxton Watson [*F*] has taken **Mr. Barry Costin** [*A*] into partnership under the style of **Watson and Costin.** The practice will continue at 57 London Road, Reigate, Surrey.

Mr. Arthur Walker [*L*] has taken over the practice of the late Frank E. Buckley [*L*] and will now be practising from 35 Hoghton Street, Southport, Lancs.

CHANGES OF ADDRESS

Mr. Lyall Addleson [*A*] has changed his address to 16 Brampton Grove, Wembley Park, Middlesex (Arnold 1984).

Mr. D. G. M. Chalmers [*A*] has changed his address to c/o McMorris and Sibeley, P.O. Box 98, Caledonia Lane Crossroads, Kingston, Jamaica, B.W.I.

Mr. Edmund H. G. Child [*A*] has changed his address to 4–6 High Street, Saffron Walden, Essex, where he will be pleased to receive trade publications.

Mr. J. R. Coward [*A*] has changed his address to 'Havrak', Feock, Truro, Cornwall.

Mr. Gerald A. Davies [*A*] has changed his address to 11 Broadway Avenue, Toronto, Ontario, Canada.

Mr. K. G. Gibbs [*A*] has changed his address to 6 Leyswood Gardens, Newbury Park, Ilford, Essex.

Mr. Norman T. Gilroy [*A*] has changed his address to 870 Kieth Road, West Vancouver, B.C., Canada.

Mr. Geoffrey E. Grimsley [*A*] has changed his private address to The Woodlands, Bicton, Shrewsbury.

Mr. H. R. Hayhoe [*A*] had changed his address to 5 Tiverton Road, Potters Bar, Middlesex (Potters Bar 6808).

Mr. H. M. Hughes [*A*] has changed his address to 23 Usk Road, Tilehurst, Reading, Berks.

Mr. Stewart Kilgour [*A*] has changed his address to 19 Quarry Road, St. Giles's Hill, Winchester, Hants.

Mr. A. V. Lobban [*F*] has retired from the post of Deputy County Architect to the East Suffolk County Council, and his address is now The Laurels, Chelmondiston, nr. Ipswich, Suffolk.

Mr. H. V. Marinier [*A*] has changed his address to 213–214 Sanlam Building, Church Street, Klerksdorp, Transvaal, South Africa.

Mr. John Strong [*A*] has opened an office at 137 High Street, Billericay, Essex (Billericay 983).

Mr. Kenneth S. Tayler [*A*] has changed his address to 14 Gordon Square, London, W.C.1 (EUSton 3727).

Mr. Alex F. Watson [*A*] has changed his address to 13 Gillingham Street, London, S.W.1 (VICtoria 6322).

Mr. N. Terence Wilson [*A*] has changed his address to 57 Beauchamp Place, London, S.W.3. (KNIghtsbridge 0697).

PRACTICES AND PARTNERSHIPS WANTED AND AVAILABLE

Associate (37) wishes to dispose of well-established private practice in east midlands area. Ten years' office lease at very low rental with all office furniture, equipment, stationery available. Small staff also available. Box 73, c/o Secretary, R.I.B.A.

Associate (32), energetic and experienced, requires partnership preferably outside London. Some capital available. Box 83, c/o Secretary, R.I.B.A.

Associate (30), Liverpool graduate, three years in Canada, latterly as architect to construction and housing development company, six years prior experience in U.K. on all types of work, seeks responsible appointment leading to partnership. Some capital available. Box 84, c/o Secretary, R.I.B.A.

Associate (39) has small, established practice in West Kent, with ample accommodation and facilities to share low rent, secretary, etc., providing mutual consultation and sharing of responsibilities. Box 85, c/o Secretary, R.I.B.A.

Essex Associate (50), with good industrial engineering experience, seeks junior partnership with busy industrial architects, London, southern counties, or Wales. Some capital available. Box 88, c/o Secretary, R.I.B.A.

Associate, A.M.T.P.I., in own practice, desires partnership or position leading thereto in London area, or would consider amalgamation with another architect. Wide private practice experience mainly in shops, industrial work, housing including multi-storey flats, office blocks, churches, schools. Some capital available if necessary. Box 91, c/o Secretary, R.I.B.A.

Established London firm have vacancy for junior partner. Must have first-class professional and social qualifications. Knowledge of private practice essential. Age under 40 years. Box 93, c/o Secretary, R.I.B.A.

Associate with own practice, seeks partnership in small busy practice in southern counties or in or near south coast town. Small capital, would consider working arrangement leading to early take-over from retiring principal. Alternatively would consider purchase of such a practice. Very wide experience, keen young outlook. Box 97, c/o Secretary, R.I.B.A.

Associate, 27 years standing, wide and valuable experience, requires partnership or possible future partnership. Preliminary working period will be accepted. Some work and capital available. Box 98, c/o Secretary, R.I.B.A.

Associate, Dip. Arch.(Birm.) (37), seeks partnership or position leading thereto. Broad experience in private practice. West Midlands preferred but not essential. Some capital available. Box 99, c/o Secretary, R.I.B.A.

WANTED AND FOR SALE

Member requires three double elephant or antiquarian drawing boards and T-squares in fair condition. Box 89, c/o Secretary, R.I.B.A.

For Sale. Drawing table 7 ft. 6 in. × 3 ft. 4 in. with two small drawers. May be seen in London. Box 92, c/o Secretary, R.I.B.A.

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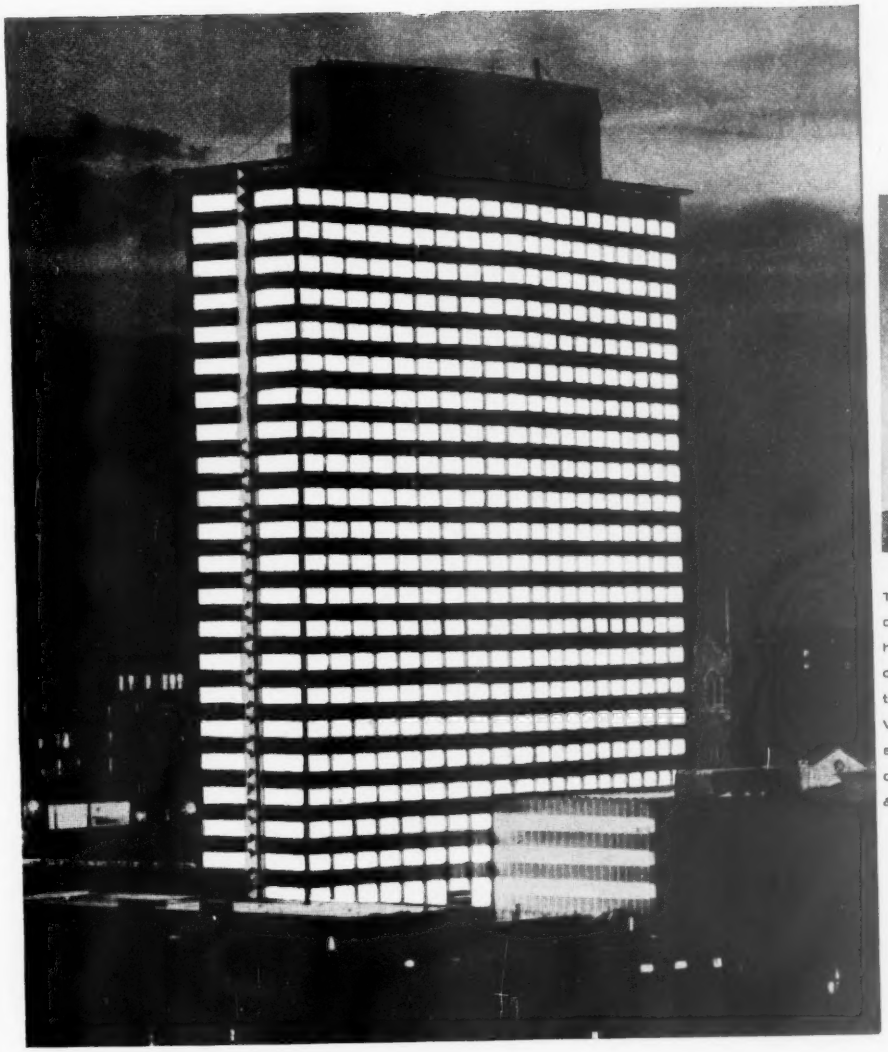

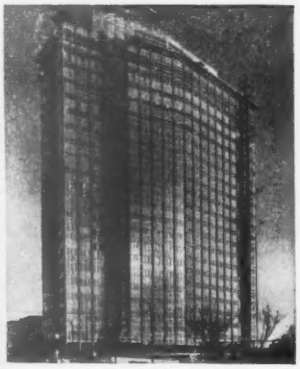

The B.C. Electric building, newly completed in Vancouver, is 258 feet high and has a total floor area of over 368,000 square feet. Architects: Thompson, Berwick & Pratt, Vancouver. Contractors: John Laing and Son (Canada) Limited. Wallspan curtain walling system by Williams & Williams Ltd.

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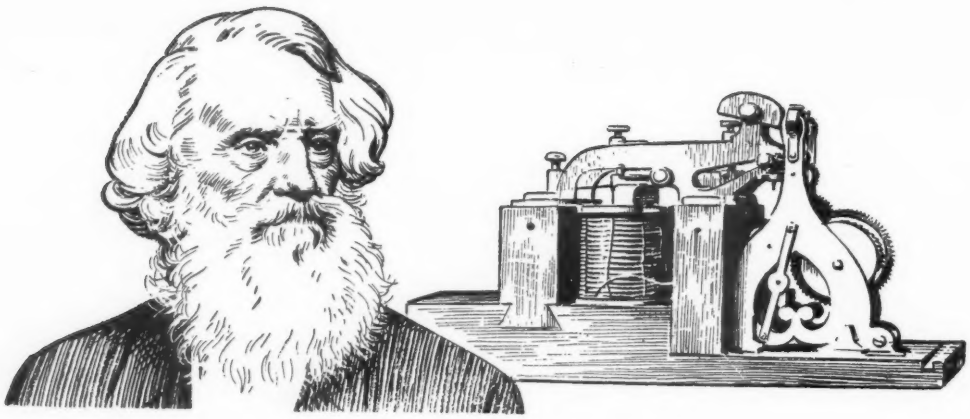
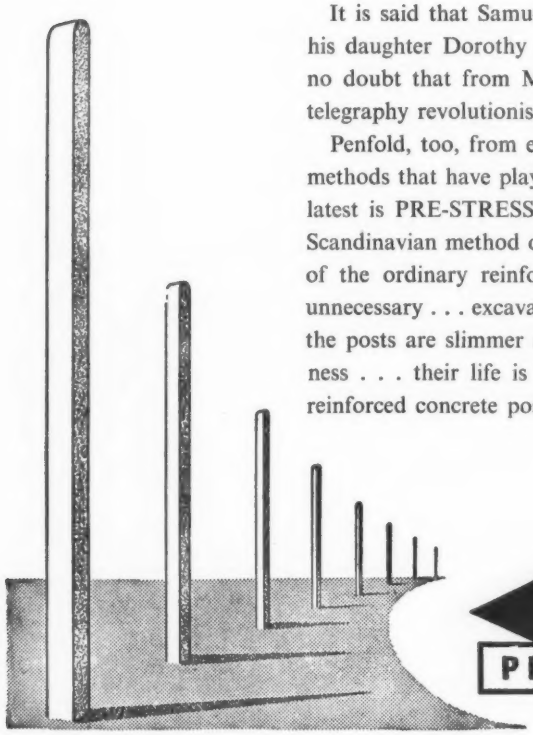


WHAT'S IN A NAME . . . ?



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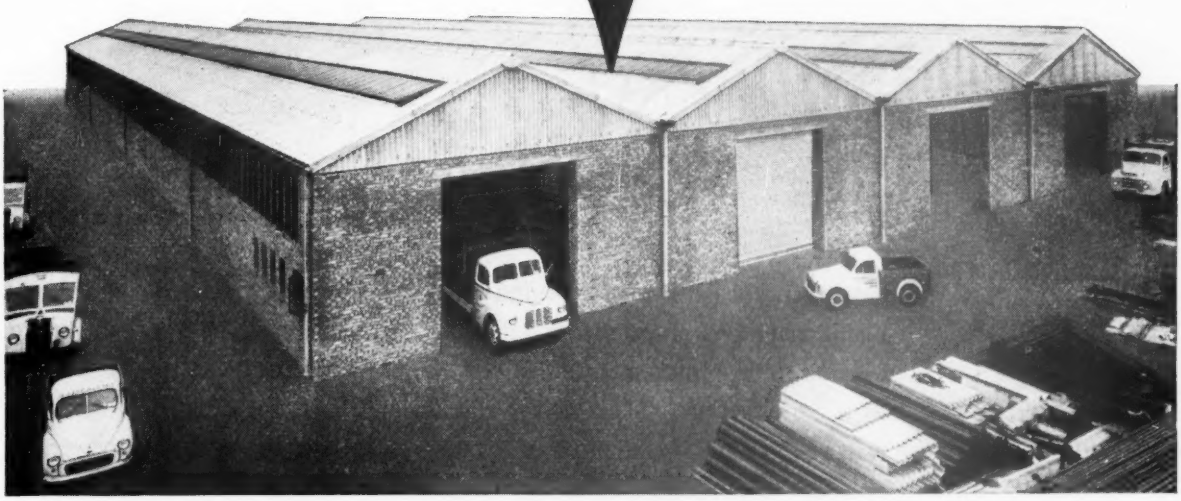

FACTS AND FIGURES

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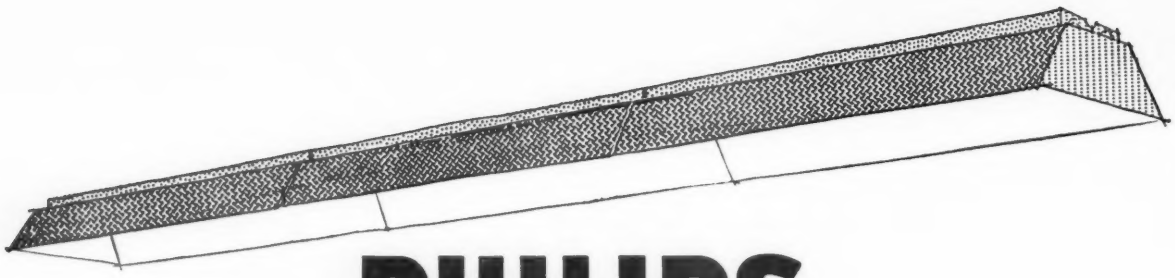

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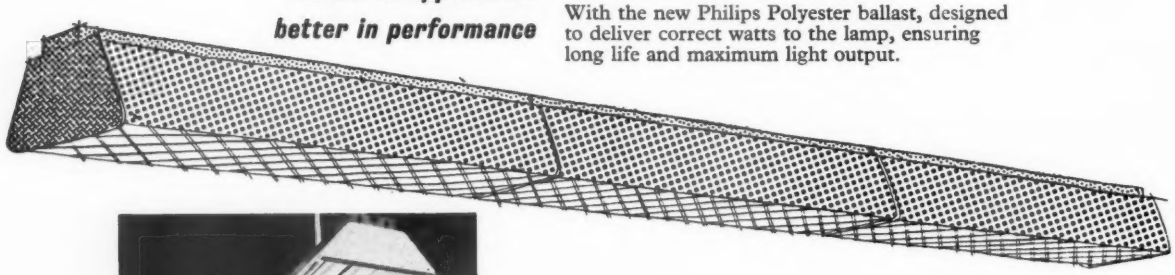

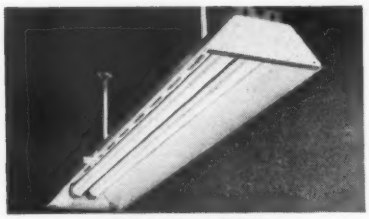

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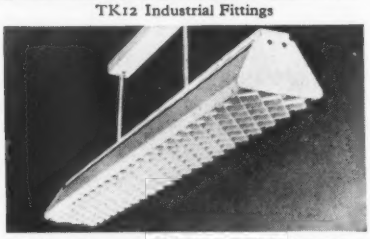

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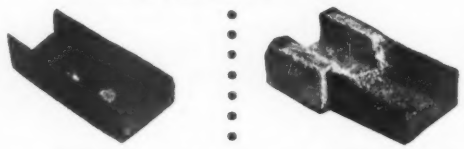

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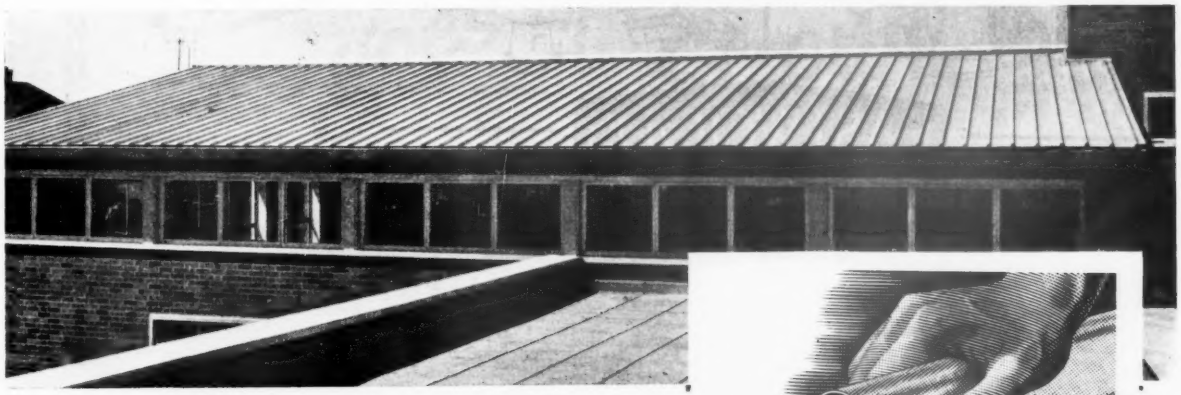

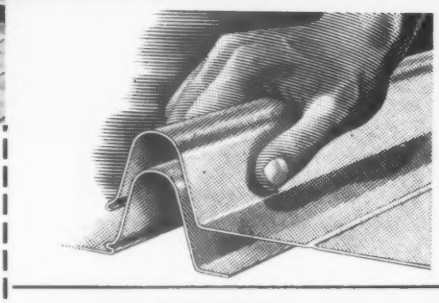

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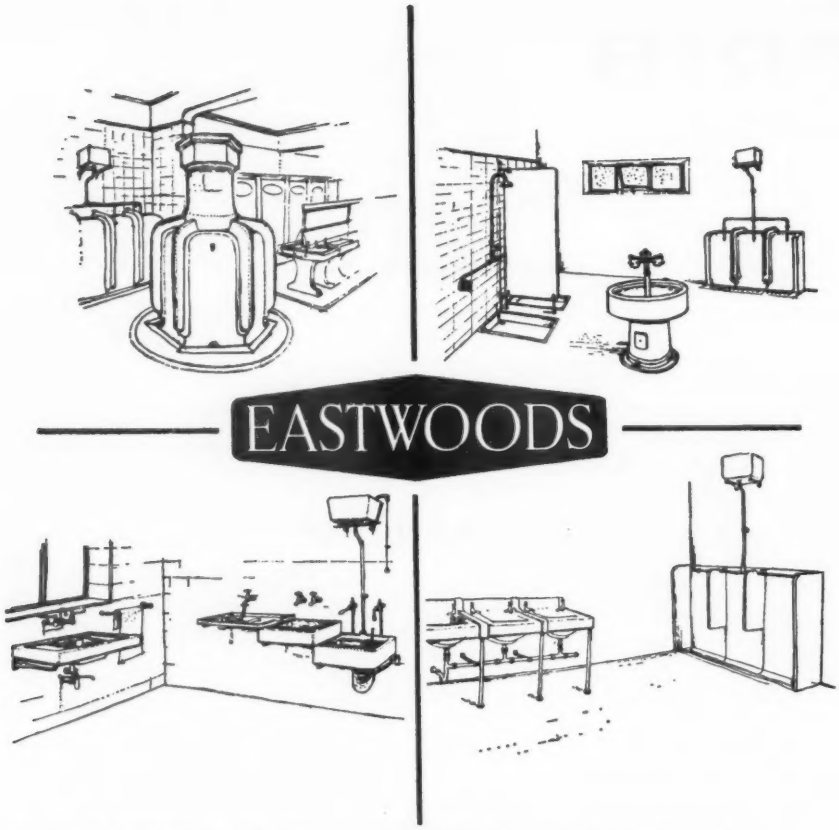

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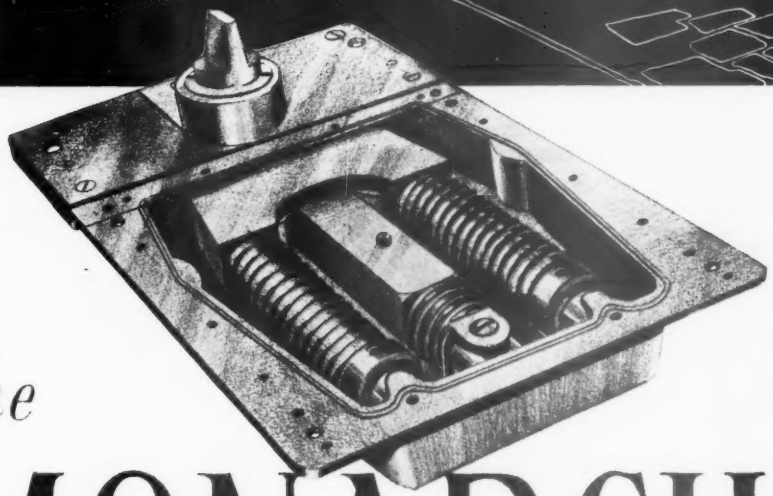

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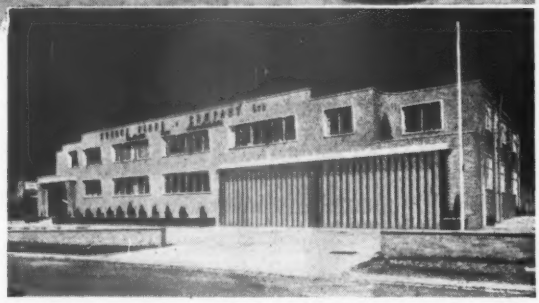

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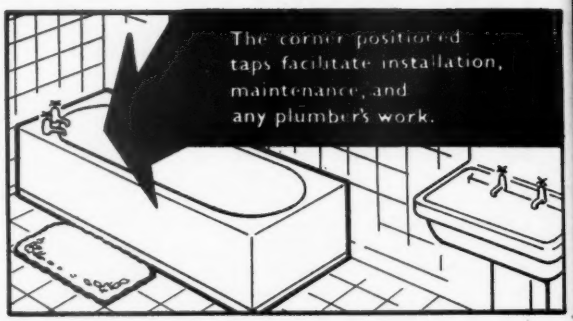

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BUILDING RESEARCH STATION DIGEST

November 1957

104

Miscellany:

plastering on dense concrete

reinforced concrete using lightweight aggregates

cracking of glass in steel window frames

PLASTERING ON DENSE CONCRETE

Walls and soffits of dense concrete cast *in situ* are among the more difficult backgrounds that the plasterer has to contend with, particularly when the surface has been left smooth by steel shuttering. The B.S. Code of Practice for internal plastering (CP.211 : 1949) restrict the choice of mixes for plastering on *in situ* concrete to those based on gypsum plaster. It also recommends that an adequate key should be provided during casting, i.e. by the use of special shuttering or of surface retarders, where it is known beforehand that the concrete surfaces are to be plastered. In practice this provision is seldom observed, partly, no doubt, because of the extra cost of the special shuttering or other treatment; sometimes, too, it is decided to plaster only when it is found that the concrete surfaces left from the shuttering are unacceptable as a fair finish. Plaster then has to be applied to a relatively smooth concrete surface which may have been hacked more or less thoroughly after stripping the shuttering.

Failures are not frequent, despite the unfavourable conditions, but when they do occur they involve very large areas and, because they happen well after the building has been occupied, the failure and consequential repair work cause considerable inconvenience.

Nature and causes of failure

The failure usually takes the form of complete separation of the plaster from the concrete soffit. The surface of the concrete may be left quite clean or, particularly when a sanded undercoat has been used, a film of plaster may be left adhering to it. The primary cause of any failure of this kind is, of course, the breaking of the adhesion between the concrete and plaster, but it was not clear why good adhesion was not obtained on some jobs carried out by experienced plasterers. To obtain better understanding of the factors that lead to failure, a programme of tests was carried out to measure the adhesion under various conditions. Inspections were also made of several extensive failures.

(*a*) Applied to wetted concrete. (*b*) Applied to dry concrete.

Fig. 1 Surface of plaster stripped from concrete slab. The air bubbles, formed at the interface where the concrete was dry, reduce the area of adhesion.

The conclusions drawn from this investigation were that very good adhesion to concrete backings can be obtained with suitable retarded hemi-hydrate plasters, and that when failure does occur it is due to inadequate control of the suction of the concrete.

Although the Code of Practice recommends that "if necessary the surface should be wetted (not saturated) to provide correct suction",

there is considerable disagreement among plasterers as to the advisability of wetting dense concrete before plastering. Some plasterers consider this to be normal good practice; others argue that it is liable to kill what little suction there is in what is undoubtedly a low-suction background, and to cause difficulties in application. The results obtained with experimental panels proved conclusively, however, that wetting the surface of smooth concrete considerably improved the adhesion of both neat and sanded hemihydrate gypsum plasters.

One reason for this improved adhesion is made clear by the photograph (Fig. 1) of a plaster surface after removal from a smooth concrete panel, one end only of which had been wetted before plastering. It will be seen that the surface of the plaster that was in contact with the wetted end is dense, whereas the surface that was in contact with the dry end is very porous, the effective area of contact with the concrete being considerably reduced.

Proprietary bonding liquids, based on polyvinyl acetate emulsion, are recommended by their makers for treating smooth concrete prior to plastering to improve the adhesion of plaster, and the present investigation has shown them to be effective for this purpose.

It is not only to carry the weight of the plaster that good adhesion is needed; the adhesion must also be capable of resisting the shearing forces set up at the junction of the two materials by differential movements between them which tend to shear the plaster off. These movements arise from differences in the drying shrinkage of the plaster and concrete and from differences between the thermal expansion of the two materials. The characteristics of the movements due to these two causes indicate that differential thermal movements are the more likely cause of failure. Much of the drying shrinkage of a concrete slab may have been completed before the plaster is applied and tests indicate that much of the stress produced in the plaster by shrinkage of the concrete can be relieved under damp conditions by a process somewhat similar to creep of concrete. Thermal movements occur much more quickly, so that there is no time for the slow creep to reduce their effect. The conclusion that thermal movements are the more important was confirmed by finding that failures in practice usually coincided with an increase in temperature in the building and were mostly associated with concretes having coefficients of thermal expansion much less than that of plaster.

As it is impossible to avoid these differential thermal movements it is particularly important to ensure good adhesion to concretes that have a low coefficient of thermal expansion, e.g. brick, granite or limestone concrete. An important fact about the stresses caused by a given temperature change is that they increase with the thickness of plaster. This means that a single coat of plaster is preferable to more than one coat; dense concrete is, however, the only background to which this applies.

To sum up, there is no doubt that if the recommendations of the Code of Practice are strictly observed, a good job will result. The following are the main points that should be considered.

(1) If it is known that concrete surfaces are to be plastered, steps should be taken, in consultation with the plastering contractor, to provide some mechanical key on the soffit by using shuttering with rough surfaces, by suitable retarders, or special inserts in the shuttering to provide keys.

(2) Shuttering should be level and true to enable a single coat of plaster to be used; joints should be tight, to avoid "fins".

(3) (*a*) Brush surface with a wet brush just before plastering (water should not be visible on the surface) or (*b*) use a proprietary bonding liquid of the polyvinyl acetate type according to makers' instructions.

(4) Use one-coat work if possible; the total thickness of two-coat work should be not more than $\frac{3}{8}$ inch.

REINFORCED CONCRETE USING LIGHTWEIGHT AGGREGATES

Lightweight aggregates have been widely used for precast blocks and for non-structural purposes, but in this country their use for reinforced concrete work has not been extensive. They have been described in Digest No. 32. Most of them are man-made; the natural ones, such as pumice, do not occur in this country. Clinker, a waste material, and foamed slag, a

manufactured product, have until recently provided the bulk of the lightweight aggregates, but others made from shale and pulverized-fuel ash have lately been introduced.

The use of these aggregates in concrete can lead to significant reductions in the dead load of the structure with many resultant economies. In addition, they can supplement usefully the available supplies of natural aggregate of which there are indications of shortage in some parts of the country.

In the light of present knowledge and experience, some of these aggregates may safely be used for certain kinds of reinforced concrete work. Others, such as clinker, vermiculite and organic aggregates, should not be so used. B.S. Code of Practice (C.P.114, 1957) "The Structural Use of Reinforced Concrete in Buildings" permits the use of aggregates other than natural gravel, stone or rock complying with B.S.822, in a crushed or uncrushed state in reinforced concrete, subject to certain conditions. Among the aggregates explicitly admitted are foamed blastfurnace slag complying with B.S.877 and natural pumice. However, this list is not exhaustive and the designer is free to use "other types of aggregates which are suitable, having regard to their strength, durability and freedom from harmful properties"; among these may be included expanded clay, expanded shale and sintered pulverized-fuel ash.

If a lightweight concrete satisfies the general strength requirements of the Code, then no further distinction is made: reinforced concrete made with it may be designed to the same permissible stresses as would apply if dense aggregates complying with B.S.882 were used. In addition, however, the Code provides for the use of concretes of lower strength, by recommending certain reductions in permissible design stresses and increases in factors of safety.

The Code of Practice has been prepared for the guidance of qualified reinforced-concrete engineers; it should be interpreted and applied with reasonable caution. Some provisions of the Code relate to normal cases only and should not be used with new materials or methods of construction—such as reinforced lightweight concrete—without examining the special conditions that are likely to be present in such cases. In particular, the engineer will allow for lower bond strength (between concrete and reinforcement), lower shear strength in the concrete, and relatively greater deflection under load of reinforced lightweight-concrete flexural members.

Experience with existing reinforced lightweight concrete structures (abroad mainly), shows that the durability of reinforced concrete slabs and of other structural elements made of lightweight concrete is satisfactory where these elements are in a sheltered position, for example, floor slabs or beams in dwelling houses or in office buildings, where the atmosphere is not very humid and/or industrially polluted. It is known, however, that failures due to corrosion of the reinforcement have occurred where lightweight-concrete flexural elements were in a heavily polluted atmosphere, for example, in the roofs of steel works or iron foundries. Heavy condensation on the underside of lightweight concrete roofs has also been a cause of failures.

The principles governing the durability of reinforced concrete made with lightweight aggregates are much less well established than those governing the durability of reinforced concrete made with ordinary heavy aggregates. An investigation is being carried out by the Station on the production against corrosion afforded by lightweight concrete to reinforcement embedded in it.

For equal volumes of concrete, lightweight aggregates require a larger amount of mixing water than dense aggregates. This needs to be remembered when allowing time for *in situ* work to dry out before finishes are applied.

THE CRACKING OF GLASS IN STEEL WINDOW FRAMES

The Station has received numerous reports of cracks occurring in panes of glass fixed in steel window frames. In general the trouble is confined to window frames manufactured before the war, but there have also been a few instances with frames manufactured immediately after the war. On one housing estate an average of 4 panes per house per year needed replacement.

Investigation has shown that the cracking is always associated with rusting of the window frames. The formation of rust, particularly at

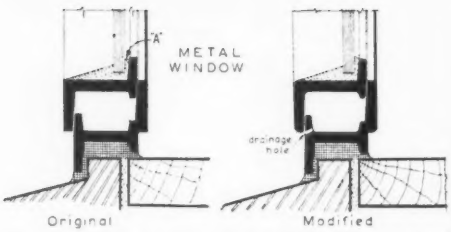

Fig. 2: Treatment of steel window frame to reduce risk of corrosion. Sharp edges have been rounded, a drainage hole provided, and the back-putty struck off to prevent water collecting at "A".

the back of the putty, puts the glass in a state of strain and this itself may cause the glass to crack in time. Otherwise movements of the metal frame, caused by changes in temperature, may be sufficient to crack the glass already in a state of strain. Thus cracking sometimes occurs at night when the frames cool down after a hot summer day. Kitchen and bathroom windows are affected more than others; with these there is a greater chance of moisture condensing on the internal face and running down the glass to the bottom glazing bars. Where the back-puttying is not full and complete, this moisture is able to lodge in a position where it can do most damage (Fig. 2: point marked "A"). Rust often spreads under the paint film, particularly if the frames have been primed with a poor quality primer. If the putty has cracked or come away from the glass, water can enter at these points and accentuate corrosion of the frame.

To profit from this experience, present-day steel windows are coated with a substantial layer of zinc which, combined with a normal paint system, affords adequate protection against rusting. Provided therefore that the glass is cut to give the usual clearance in the frame, galvanized steel window frames will not give rise to cracking of the glass.

The treatment of existing rusted steel frames is often complicated by the fact that there has been rusting of the frame where it is in contact with the brickwork, and this has led to distortion of the frame itself. An example of severe distortion of a metal frame and cracking of glass is shown in Fig. 3.

Where the rusting has become as serious as this the cheapest method in the long run will be to remove the window and replace it with a galvanized one.

Fig. 3: Cracking of glass and bulging of frame caused by corrosion of steel after about thirty years.

In less severe cases, it is suggested that the following steps should be taken. The window should be carefully examined to find all points where rust has formed and to decide whether any reglazing is to be done. Cracked glass and defective putty, which allows water to penetrate, should be removed. It is often difficult to cut out hardened putty, particularly if the glass is to be reused; mechanical routers consisting of a cutting head mounted in an electric or hand drill may be of some help. Heat will soften the putty, but even a very fine flame must be carefully used if it is not to crack the glass or distort the frame. It is often helpful in preventing or delaying recurrence of rusting to round off sharp angles with a file or grindstone in a small electric drill, and to clear or make new drainage holes.

All paint whose adhesion is suspect should be removed by scraping or by the use of paint removers. Underlying rust should be cleaned off, to expose a bright metal surface. The metal should then be primed as soon as possible with a red-lead primer to B.S.2523 Type A. When

this is dry, a second coat should be given to any sharp edges or places where water may collect and, finally, a third coat should be applied overall. If the cleaning has been properly done, other corrosion-inhibiting primers such as the "cold galvanizing paints" may be used similarly, but for general work the red-lead primer is preferable.

Reglazing should then be carried out with putty specially made for metal windows. The manufacturer should be asked what time interval is desirable before painting and whether the putty is likely to crack if left unpainted for a week or more. New back-putty should be struck off at an angle, to help drainage. A gun mastic might also be applied if water seems to be getting in where the frame is set in the opening.

The other coats of paint follow normal practice, but external quality paints should be used for both internal and external surfaces. To avoid a multiplicity of paints being used in a room, types of paint suitable for use both indoors and outdoors are available and can be used throughout.

The procedure suggested above may seem unduly costly, but is necessary if it is desired to avoid arduous preparation at each repainting.

The first subsequent repainting should be done after a shorter period than normal, so that any omissions can be remedied. Subsequent repaintings should be done before more than slight traces of rust have formed.

If for any reason these measures cannot be carried out, cracked panes should be replaced using as large a clearance as will still enable the glass to be adequately held by the clips, and using a nonhardening mastic instead of putty.

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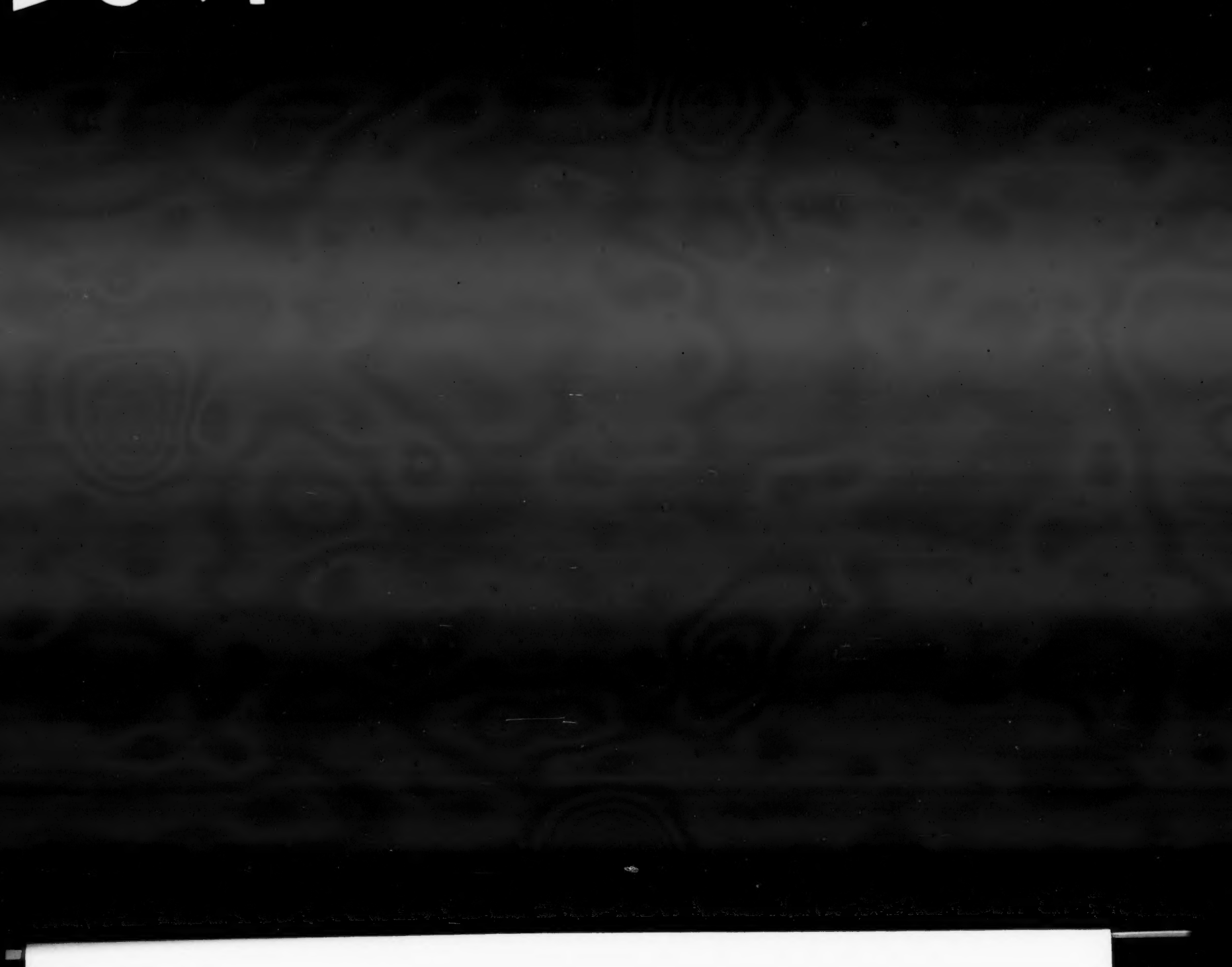

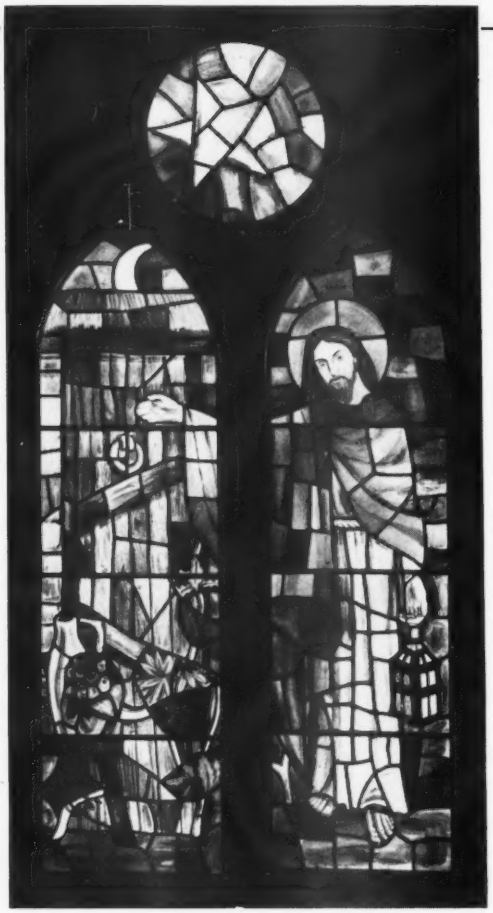

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